IMPACT OF MODERATE INTENSITY PHYSICAL ACTIVITY ON SYMPTOM SEVERITY OF PTSD AMONG MILITARY VETERANS

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Abstract: The rates of PTSD among military veterans are much greater when compared to the general population, and are higher in the U.S. than any other country. Due to the known benefits of physical activity on mental and physical health, it may be beneficial for recreational therapists to use physical activity as an alternative treatment for treating symptoms of PTSD among military veterans. Physical activity has been found to be a critical component to a biopsychosocial approach in recovery-oriented mental health services, which parallels the recreational therapist's goal of treating the four behavioral domains of a person, the cognitive, psycho/social, physical, and affective. The purpose of this study was to determine if a combination Health Belief Model and physical activity intervention could improve symptom severity of PTSD among military veterans when compared to a Health Belief Model only group. Nine participants were randomly divided into an experimental group and a control group. The dependent variables were symptoms severity of PTSD, measured using the PCL-5, barriers to accessing healthcare, measured using the BACE, and cardiovascular health, measured using the Cooper 12 Minute Walk Test. A 2X2 RM ANOVA was utilized to analyze results as well as Cohen's *d* for effect size calculations. There were no significant group effects for any dependent variables. There were significant time * group interactions for the following dependent variables, BACE total score, and BACE Stigma score ($p < .05$), and there were significant time effects for all dependent variables ($p < .05$). Effect sizes for all dependent variables in the experimental group were all large and greater than the control group effect sizes, with the exclusion of the PCL-5 Cluster E variable. Effect sizes for the control group ranged from small to large. Utilizing physical activity may provide the recreational therapist a viable, effective, efficient, and cost-effective method of treating symptom severity of PTSD among military veterans.

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CHAPTER I

INTRODUCTION

Overview

Post-Traumatic Stress Disorder (PTSD) is a condition that characteristically develops after a person experiences or is exposed to a life-threatening event, and can have a substantial negative impact on that person's physical and mental health (American Psychiatric Association (APA), 2013). According to the United States Department of Veterans Affairs (U.S. DVA) (2012), the prevalence of PTSD among military veterans ranges from 10% to 31%, depending on the war era served. These percentages are higher when compared to the prevalence among the general population, which is approximately 7% (U.S. DVA, 2012).

Military veterans who have been diagnosed with PTSD are 80% more likely to meet additional diagnostic criteria for suicidal ideation and another mental health disorder, such as substance abuse disorder or major depressive disorder when compared to the general population (APA, 2013). Individuals diagnosed with PTSD have lower adherence to positive health behaviors, with reports of increase in smoking, decrease in physical activity, and decrease in medication adherence (Zen, Whooley, Zhao, & Cohen, 2012). Buckley, Mozley, Bedard, Dewulf, and Greif (2004), found that of 826 military veterans seeking treatment for PTSD, 58% did not meet the national physical activity guidelines, as set forth by the American Heart Association (AHA) and the American College of Sports Medicine (ACSM) (Haskell et al., 2007; Pescatello, Arena, Riebe, & Thompson, 2014).

In another study, the percentage of individuals who perceived themselves as physically active decreased from 52% to 22% after being diagnosed with PTSD (de Assis et al., 2008).

Additionally, military veterans who meet the criteria for PTSD report never receiving treatment (Hoge et al., 2004), and of those who do pursue treatment experience a blunted response to psychotherapies and pharmacotherapies when compared to nonveterans (Watts et al., 2013). In addition to the blunted effects of therapy treatments among military veterans, they face numerous barriers to pursuing treatment, such as negative stigma, lack of transportation, lack of financial support, lack of time, fear of a negative impact on their career, and lack of motivation (de Assis et al., 2008; Hoge et al., 2004; Stecker, Shiner, Watts, Jones, & Conner, 2013).

Previous literature provides empirical evidence that there is an association between physical activity and greater mental and physical health (Bauman, 2004; Lai et al., 2014; Mente, de Koning, Shannon, & Anand 2009; Penedo & Dahn, 2005); however, it remains unclear whether physical activity can specifically be of benefit for individuals (e.g., veterans) with PTSD (Whitworth & Ciccolo, 2016). Implementing non-pharmacological interventions, such as physical activity (which is commonly used to provide treatment for various mental health diagnoses), may provide numerous benefits for military veterans with PTSD, such as managing symptoms, reducing common comorbid conditions (e.g., cardiovascular diseases), and eliminating barriers to treatment (Hall, Hoerster, & Yancy, Jr., 2015; Whitworth & Ciccolo, 2016). Due to the known benefits of routine physical activity on mental and physical health (de Assis et al., 2008; Hoge et al., 2004; Watts et al., 2013), it may be beneficial to explore non-pharmacological treatment, such as recreational therapy facilitated recreational physical activity (Hall et al., 2015; Whitworth & Ciccolo, 2016).

The Health Belief Model (HBM) was designed to help determine if an individual will adopt a health behavior, such as physical activity, as a preventive health measure to treat a diagnosed illness (Carpenter, 2010; Eraker, Kirscht, & Becker, 1984; Jones, Smith, & Llewellyn, 2014). The HBM

theorizes that an individual's readiness to act is based upon perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, modifying variables, and cues to action (Pescatello et al., 2014; Rosenstock, Stretcher, & Becker, 1988). Therefore, it may be beneficial to utilize the premise of the HBM when designing a recreational therapy facilitated recreational physical activity program for military veterans who have been diagnosed with PTSD (Castonguay, Filer, & Pitts, 2016; Fitzpatrick et al., 2008; Mirotznik, Feldman, & Stein, 1995; Mo, Chong, Mak, Wong, & Lau, 2016; Speer et al., 2008).

Significance of the Study

Considering the prevalence of PTSD among military veterans in the United States (U.S.), which is higher than any other country in the world, it is becoming increasingly important to find alternatives to traditional treatment (e.g., pharmacological and psychotherapy) for PTSD (Kessler et al., 2005; Kessler & Ustun, 2008). The association of PTSD and comorbid conditions such as, substance use disorder and major depressive disorder (Dedert et al., 2009), suicidal ideation (Yaffee et al., 2010), generalized anxiety disorder (Hoge et al., 2004), chronic pain (Lew et al., 2009), increased risk of cardiovascular disease, and lower adherence to physical activity and smoking cessation (Zen et al., 2012), it may be beneficial for recreational therapists to seek effective non-pharmacological treatment modalities, such as physical activity (Hall et al., 2015; Tsatsoulis & Fountoulakis, 2006; Whitworth & Ciccolo, 2016). Physical activity has been found to be a critical component to a biopsychosocial approach in recovery-oriented mental health services (Richardson et al., 2005), which parallels to a recreational therapists goal of treating the four behavioral domains of a person, cognitive, psycho/social, physical, and affective (Austin, Crawford, McCormick, & Puymbroeck, 2015).

The HBM was designed to help determine if an individual will adopt a health behavior (e.g., physical activity) as a preventive health measure to treat a diagnosed

illness (e.g., PTSD) (Carpenter, 2010; Eraker et al., 1984; Jones et al., 2014). Due to the known benefits of physical activity on mental and physical health (Bauman, 2004; Lai et al., 2014; Mente et al., 2009; Penedo & Dahn, 2005), it may be beneficial to determine if a recreational physical activity intervention designed on the premise of the HBM can serve as an effective mode of treatment for military veterans diagnosed with PTSD (Castonguay et al., 2016; Fitzpatrick et al., 2008; Mirotznik et al., 1995; Mo et al., 2016; Speer et al., 2008). Additionally, considering the major barriers associated with seeking treatment for military veterans, it may be useful to identify their perceptions of barriers to participating in recreational physical activity compared to traditional treatments (Hall et al., 2015; Whitworth & Ciccolo, 2016).

This research is significant because there are limited studies specifically aimed at reducing the severity of symptoms of PTSD among military veterans. Traditional recreational therapy interventions for the military veteran population consist of acute, nature-based modalities (Hawkins, Townsend, & Garst, 2016) such as outdoor recreation interventions (Vella, Milligan, & Bennett, 2013), river running (Dustin, Bricker, Arave, Wall, & Wendt, 2011), fly-fishing (Bennett, Piatt, & Puymbroek, 2017), and adaptive sports (Lundberg, Bennett, & Smith, 2011). It is important to note the average length of a traditional recreational therapy intervention for the treatment of military veterans with PTSD or other related disabilities. In a research study by Vella and colleagues (2013), an outdoor recreation intervention consisted of a two night, three day intervention period. Similarly, in a study conducted by Bennett and colleagues (2017) a fly-fishing program utilized as a treatment modality lasted four days, and lastly, in a study conducted by Vella and colleagues (2013), an adaptive sports and recreation program lasted seven days. To the primary researcher's knowledge, the current research study will enrich the current literature by adding how longer interventions can impact military veterans experiencing symptoms of PTSD. The findings of this research may have the potential to open up an area in the literature for further exploration in addition to making a contribution to treatments that military veterans with PTSD may receive.

Purpose of the Study

The purposes of this research study are to determine if a four-week recreational physical activity intervention combined with components of the HBM can on average serve as an efficient modality to treat symptoms of PTSD among military veterans when compared to a four-week intervention based only on components of the HBM; determine if a four-week recreational physical activity intervention combined with components of the HBM can on average improve cardiovascular health among military veterans with symptoms of PTSD compared to a four-week intervention based only on components of the HBM; and to determine if a four-week recreational physical activity intervention combined with HBM can one average reduce perceived barriers to treatment compared to a four-week intervention based only on components of the HBM.

Research Questions and Hypotheses

RQ1. Will a combined HBM and recreational physical activity intervention have a greater decrease in PTSD symptoms among military veterans than a HBM only intervention?

> H_1: A combined HBM and recreational physical activity intervention will on average have greater improvement in symptoms of PTSD among military veterans when compared to a HBM only intervention.
>
> H_o: There will be no difference in improvement of symptoms of PTSD between a combined HBM and recreational physical activity intervention and a HBM only intervention.

RQ2. Will a combined HBM and recreational physical activity intervention have a greater improvement in cardiovascular health among military veterans with symptoms of PTSD than a HBM only intervention?

H_1: A combined HBM and recreational physical activity will on average have a greater improvement in cardiovascular health symptoms among military veterans with symptoms of PTSD when compared to a HBM only intervention.

H_o: There will be no difference in improvement in cardiovascular health symptoms between a combined HBM and recreational physical activity intervention and an HBM only intervention.

RQ3. Will a combined HBM and recreational physical activity intervention have a greater reduction in perceived barriers among military veterans with symptoms of PTSD than a HBM only intervention?

H_1: A combined HBM and recreational physical intervention on average will have a greater reduction in perceived barriers to treatment for military veterans with symptoms of PTSD when compared to a HBM only intervention.

H_o: T there will be no difference in reduction in perceived barriers to treatment between a combined HBM and recreational physical activity intervention and an HBM only intervention.

Definition of Terms

- Aerobic exercise: oxygen-requiring energy reactions (Haskell et al., 2007; Pescatello et al., 2014).
- Anaerobic exercise: non-oxygen, chemical requiring energy reactions (Haskell et al., 2007; Pescatello et al., 2014).
- Borg Rating of Perceived Exertion (RPE): provides a useful and complementary guide to heart rate in gauging exercise intensity by having a person rate an activity as easy or

difficult based on a scale of 6 to 20; 6 equals no exertion and 20 equals maximum exertion (Haskell et al., 2007; Pescatello et al., 2014).

- Exercise: planned, structured, and repetitive bodily movement done to improve and/or maintain one or more components of physical fitness (Pescatello et al., 2014).
- Heart rate reserve (HRR): difference between resting heart rate (RHR) and maximum heart rate (MHR); $HR_{max} - HR_{rest} = HRR$ (Pescatello et al., 2014).
- High-intensity aerobic exercise: 60- < 90% HRR (Haskell et al., 2007; Pescatello et al., 2014).
- Low-intensity aerobic exercise: 30- < 40% of HRR (Haskell et al., 2007; Pescatello et al., 2014).
- Mental health: a person's collective emotional, psychological, and social well-being (World Health Organization, 2014).
- Military Veteran: an individual who has served in the armed forces and been deployed to a war zone in any of the following branches, Army, Navy, Marines, Air Force, and Coast Guard; this may also include veterans who have identified as a reservist (Shiner, 2011; Stecker et al., 2013).
- Moderate-intensity aerobic exercise: 40 < 60% or HRR (Haskell et al., 2007; Pescatello et al., 2014).
- Physical activity: any bodily movement produced by the contraction of skeletal muscles that result in a substantial increase in caloric requirements over resting energy expenditure (Pescatello et al., 2014).
- Physical Activity Guidelines: participating in moderate-intensity physical activity for at least 30 minutes per day for five days per week totaling 150 minutes of moderate-intensity physical activity per week (Haskell et al., 2007; Pescatello et al., 2014).

- Posttraumatic Stress Disorder: history of exposure to a traumatic event/s that elicits symptoms from four groups: intrusion, avoidance, negative alterations in cognitions/mood, and alterations in arousal and reactivity (APA, 2013).

CHAPTER II

LITERATURE REVIEW

Due to the considerably high rates of PTSD among United States (U.S.) military veterans, it is becoming increasingly important to find non-pharmacological treatments to existing traditional treatments (Kessler et al., 2005; Kessler & Ustun, 2008). Due to known associations between PTSD and comorbid mental and physical health conditions (Dedert et al., 2009; Hoge et al., 2004; Lew et al., 2009; Yaffee et al., 2010; Zen et al., 2012), it may be beneficial for recreational therapists to seek effective non-pharmacological treatment modalities, such as recreational physical activity programs premised on the Health Belief Model (HBM) (Hall et al., 2015; Tsatsoulis & Fountoulakis, 2006; Whitworth & Ciccolo, 2016). The purpose of this literature review is to synthesize the existing literature on the physical and mental health benefits of physical activity for military veterans with symptoms of PTSD, as well as provide a description about the HBM.

Background on PTSD

According to the APA (2013), PTSD is a condition that typically develops after an individual has been exposed to, or experienced a life-threatening circumstance. The criteria for a person to receive a diagnosis of PTSD includes being exposed or experiencing a traumatic event, having symptoms of intrusion, avoidance of stimuli related to the traumatic event, alterations in cognitions and mood, alterations in arousal and reactivity, duration of symptoms,

and impaired social or occupational interactions (not caused by substance abuse) (APA, 2013, pp. 271-272).

There are four major categories of symptoms for PTSD: intrusion, avoidance, arousal, and negative thoughts and mood (APA, 2013). Intrusive symptoms may include re-experiencing the traumatic event through flashbacks or night terrors. Avoidance symptoms may include specific efforts to evade negative memories, feelings, conversations, or thoughts. Arousal symptoms may include experiencing disproportionate emotions, hostile behavior, self-destructive behavior, and hyperarousal or anxiety. Symptoms of negative thoughts and mood may include memory loss, blaming of self, blaming of others, and erratic mood fluctuations (APA, 2013, pp. 271-272).

A military veteran may develop PTSD after being exposed to a life-threatening combat-related event, facing combat guilt, associated war politics, and military sexual trauma; and is one of the most commonly diagnosed disorders (Smith, Goldstein, & Grant, 2016; Wisco et al., 2014). Results from a large epidemiological study showed the lifetime prevalence estimates of PTSD were higher among U.S. military veterans than the general population, even when stratified demographically (Kessler et al., 2005; Smith et al., 2016). Considering the lifetime prevalence of PTSD in the U.S. (7%) is higher than in any other country in the world, as well as higher among military veterans when compared to the general population (10% - 31%) it may be beneficial to find effective non-pharmacological treatments (Kessler & Ustun, 2008).

Common co-occurring disorders associated with PTSD may include the following, but is not limited to, substance use disorder and major depressive disorder (Dedert et al., 2009), suicidal ideation (Sareen et al., 2007; Sareen, Houlahan, Cox, & Asmundson, 2005), neurocognitive impairments (Lew et al., 2009; Sareen et al., 2007; Sareen et al., 2005; Yaffe et al., 2010), generalized anxiety disorder (Hoge et al., 2004), chronic pain (Lew et al., 2009), increased risk of

cardiovascular disease (Zen et al., 2012), and lower adherence to positive health behaviors, such as an increase in smoking and a decrease in physical activity adherence (Zen et al., 2012). Most recently, Smith and colleagues (2016) conducted a study to determine the prevalence, correlates, and psychiatric comorbidity associated with PTSD among U.S. military veterans (n = 3119). Prevalence of PTSD was greater among individuals who were not married, of lower socioeconomic status (SES), experienced more than two traumatic events, were female, or of a non-white race (Smith et al., 2016). Further analysis in this study and when controlling for the above demographics, the association between PTSD and co-occurring psychiatric disorders was greatest for personality disorders (11%), mood disorders (10%), anxiety disorders (10.6%), and substance abuse (3%) (Smith et al., 2016). Similarly, Wisco and colleagues (2014) conducted a study to determine the prevalence of PTSD and associated co-occurring psychiatric disorders among U.S. military veterans (n = 3157). The authors also found that veterans with PTSD had a higher probability of experiencing mood disorders, anxiety, and substance abuse disorders ($p < .001$). However, protective psychosocial factors, such as resiliency, community re-integration, and social support were associated with a decreased probability ($p < .05$) of having a co-occurring disorder (Wisco et al., 2014). Data gathered from this study were not gathered through diagnostic interview but through validated self-report questionnaires and may pose some limitations to the results (Wisco et al., 2014). Feder et al. (2016) conducted a similar study, which utilized a sample population of disaster responders from the World Trade Center attacks (n = 4487), to analyze psychosocial factors associated with less severe symptoms of PTSD. Results produced comparable findings concluding that psychosocial factors such as positive emotion-focused coping, sense of purpose in life, and lower use of substance as a coping mechanism were associated with less severe symptoms of PTSD (Feder et al., 2016).

Although suicidal ideation is not a co-occurring disorder, it is a common symptom of co-occurring diagnoses among military veterans with PTSD (APA, 2013; Sareen et al.,

2007). According to the U.S. DVA (2012), although the existing body of literature is not conclusive, there is strong evidence that military veterans who experienced multiple wounds and hospitalizations from combat related trauma are at a higher risk for suicide. There is also a strong relationship between suicide risk and military veterans diagnosed with PTSD, even when controlling for comorbid health disorders (U.S. DVA, 2012). Sareen et al. (2007) utilized the general population and veterans who had been diagnosed with PTSD (n = 36,984) to determine the impact of PTSD on comorbidity, disability, and suicidal behavior. Researchers found there was a statistically significant association between PTSD and low psychological well-being ($p < .001$), high distress ($p < .001$), one or more days of debilitating mental health problems ($p < .001$), suicide attempts ($p < .01$), and long term reduction in activities ($p < .001$) (Sareen et al., 2007). Authors also found that PTSD was also significantly associated with respiratory conditions ($p < .001$), chronic pain ($p < .001$), cardiovascular diseases ($p < .001$), neurologic diseases ($p < .05$), and gastrointestinal diseases ($p < .05$) (Sareen et al., 2007). Researchers concluded that due to the significant associations of PTSD and poor physical and mental health, future research should be conducted to determine efficient, feasible, and cost-effective treatments that address mental and physical health (Sareen et al., 2007).

It should also be noted that in addition to the common co-occurring psychiatric disorders there are also associated poor health behaviors associated with PTSD, such as poor eating habits and decreases in physical activity (de Assis et al., 2008; Hall et al., 2015; Whitworth & Ciccolo, 2016). Zen and colleagues (2012) examined the relationship between PTSD and poor health behavior among individuals with cardiovascular disease (n = 1022). Individuals who had been diagnosed with cardiovascular disease and PTSD were more likely than those without PTSD to experience lower rates of physical activity ($p = .045$), higher rates of medication nonadherence ($p = .04$), skipping medications ($p = .03$), and higher rates of smoking ($p = .006$) (Zen et al., 2012). De Assis et al. (2008) found similar results among Brazilian patients with PTSD.

Participants were more likely to have lower levels of physical activity and sport participation than individuals who did not have PTSD. Specifically analyzing the differences between physical activity and sedentary time among military veterans (n = 900) and non-veterans (n = 2036), results were indicative that veterans may be less physically active when compared to nonveterans as well as suggestive that veterans spend more leisure time on sedentary activities (de Assis et al., 2008).

Despite the prevalence of PTSD and co-occurring disorders among many U.S. military veterans, and the various treatment options offered, 23% to 40% (Hoge et al., 2004) do not receive treatment for mental health issues (Shiner, 2011; Stecker et al., 2013). According to Stecker and colleagues (2013), there are four major perceived barriers to military veterans from Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) seeking treatment for PTSD. Out of 143 military veterans 40% did not seek treatment due to fear of being prescribed psychotropic medication, 35% did not seek treatment due to lack of emotional readiness, 16% did not seek treatment due to concern with negative stigma, and 8% did not seek treatment due to logistical issues (e.g., not having enough time, too far of a distance to treatment facility) (Stecker et al., 2013). Hoge and colleagues (2004) conducted a similar but larger study (n = 703) among military veterans of OEF/OIF. Researchers determined that of the military veterans diagnosed with a mental disorder (e.g., PTSD), only 23-40% sought treatment. Common perceived barriers included the following, not trusting mental health professionals (38%), not knowing where to go for help (22%), lack of transportation (18%), difficulty scheduling an appointment (45%), could not take time off of work (55%), too high of cost of care (41%), it would be embarrassing (41%), it would harm their career (50%), member of a soldier's unit may have less confidence in them (59%), leadership would treat them differently (63%), it is a sign of weakness (65%), and mental health care does not work (25%) (Hoge et al., 2004).

Due to the blunted effects of traditional psychotherapy treatments (Watts et al., 2013), perceived barriers to treatment (de Assis et al., 2008; Hoge et al., 2004), and co-occurring disorders (Smith et al., 2016; Wisco et al., 2014), it may be beneficial for recreational therapists to actively seek effective non-pharmacological treatment modalities, such as a recreational physical activity intervention based on theoretical framework of the Health Belief Model (Carpenter, 2010; Eraker et al., 1984; Jones et al., 2014; Whitworth & Ciccolo, 2016).

Physical Activity

Based on an exhaustive review of the literature pertaining to physiological, epidemiological, and clinical scientific data, the American College of Sports Medicine (ACSM), Centers for Disease Control and Prevention (CDC), and the American Heart Association (AHA) determined the dose-response relationship for physical activity to promote and maintain health (Haskell et al., 2007). Based on the aforementioned organizations, 30 minutes of moderate-intensity (40-60% of HRR, RPE of 5-6) aerobic physical activity per day for five days a week or vigorous-intensity (60-90% of HRR, RPE of 7-8) aerobic physical activity for 20 minutes per day for three days a week is sufficient to promote and maintain overall health [Heart rate reserve (HRR) = the difference between max heart rate (MHR) and resting heart rate (RHR), rate of perceived exertion (RPE) = a self-perception of the amount of effort given]. These standards have been set as the national physical activity guidelines (Pescatello et al., 2014).

According to the early release article from the 2015 National Health Interview Survey, it was determined that the annual percentage of adults who did not meet the national physical activity guidelines was 51%, which was slightly higher than previous year (50.8%) (Ward, Clarke, Nugent, & Schiller, 2015). Hoerster, Jakupcak, McFall, Unutzer, and Nelson (2012) reported that military veterans with a mental health diagnosis were more likely to experience physical inactivity when compared to veterans with no mental health diagnosis. De Assis and

colleagues (2008) found that after a military veteran had been diagnosed with PTSD, their perceived physical activity decreased from 52% to 22%. Buckley and colleagues (2004) also found that compared with the general population, approximately 58% of military veterans seeking treatment for PTSD did not meet the national physical activity guidelines. These studies support claims by Zen and colleagues (2012) that people diagnosed with PTSD experience more negative health behaviors, such as increases in smoking and significant decreases in physical activity.

The benefits of physical activity have been extensively studied and shown to improve a person's physiological and psychological well-being (Bauman, 2004; Haskell et al., 2007; Lai et al., 2014; Mente et al., 2009; Penedo & Dahn, 2005). Penedo and Dahn (2005) conducted a review to examine the correlates between exercise, physical activity, physical health, and mental health. They found that physical activity was able to improve health among individuals with cancer, cardiovascular disease, obesity, and sexual dysfunction. More recently, Brown et al. (2010) conducted a study to determine if aerobic exercise could serve as an adjunctive treatment for individuals with alcohol and drug dependence. Participants (n = 16) who resided in a psychiatric hospital and were either drug or alcohol dependent participated in a 12-week long moderate-intensity aerobic exercise intervention. The exercise interventions were supervised once per week and then self-monitored three more additional times per week. Participants were instructed to keep their heart rate between 55-69% of their age-predicted maximal heart rate in addition to tracking their RPE. Brown and colleagues (2010) reported that the exercise intervention was able to significantly improve days abstinent from alcohol and drug use ($p < .05$), and a significant improvement in cardiorespiratory fitness ($p < .05$). It should also be noted that participants who attended less than 75% of the session were significantly more likely to relapse than those who attended more than 75% of sessions (Brown et al., 2010).

Specific to psychological well-being, Davidson, Babson, Bonn-Miller, Souter, and Vannoy (2013) examined the impact of exercise on suicide risk among veterans with

PTSD (n = 346). Authors found a direct and indirect relationship to suicide risk; meaning that individuals who reported higher levels of exercise had lower suicide risk while those who reported lower amounts of exercise had a higher risk of suicide. These results are supportive of previous research that exercise may provide improvements in mental health (Davidson et al., 2013; Hall et al., 2015; Whitworth & Ciccolo, 2016). Additionally, Stults-Kolehmainen and Sinha (2014) conducted a systematic review of existing literature on the effects of stress on physical activity and exercise. Authors found that out of 55 studies reviewed, 76% found that stress acted as a behavioral inhibition for exercise, and 18% of studies indicated that stress was a behavioral activation, or increased physical activity (Stults-Kolehmainen & Sinha, 2014). Stults-Kolehmainen and Sinha (2014) had similar conclusions to previous research, which was that stress was an inhibitor of physical activity (Davidson et al., 2013; de Assis et al., 2008).

Recently, a meta-analysis of randomized controlled trials was conducted to understand the acute effects of exercise on state anxiety, which may be defined as emotional provocation during imminent threatening or dangerous circumstances (Ensari, Greenlee, Motle, & Petruzzello, 2015). It was reported that a single bout of exercise was able to improve state anxiety symptoms when compared to no exercise ($p < .05$) in their review of 36 randomized control trials (Ensari et al., 2015). Exercise intensities varied from low to high and some common exercise modes included cycle ergometer, yoga, treadmill, resistance training, rowing ergometer, Stairmaster, and outdoor walking (Ensari et al., 2015). Although a single bout of exercise was able to elicit improvements in daily symptoms of state anxiety, it should also be noted that higher intensity exercises were able to elicit higher effects than lower intensity exercises (Ensari et al., 2015). Due to stress being a known inhibitor for individuals to partake in health promotive behaviors, such as physical activity, and the known benefits of physical activity, it may be important for future research to specifically analyze the barriers to physical activity among military veterans (Ensari et al., 2015; Stults-Kolehmainen, & Sinha, 2014).

Specific to PTSD, Rosenbaum and colleagues (2015) conducted a systematic review and meta-analysis to examine the effects of physical activity on PTSD. A total of four randomized controlled trials were included in the meta-analysis and utilized interventions that consisted of yoga, a combination of aerobic and resistance training, and aerobic training only, and the interventions ranged in length from 6-12 weeks (with 1-2 supervised sessions per week). Results were indicative that individuals diagnosed with PTSD who were placed in the physical activity groups did see significant reductions in symptoms ($p < .05$) (Rosenbaum et al., 2015). Authors reported that physical activity may be an effective intervention for improving symptoms of PTSD; however, more research needs to be conducted to determine effectiveness and most efficient method of implementing the intervention (Rosenbaum et al., 2015).

Implementing non-pharmacological interventions, such as physical activity, may provide numerous benefits for military veterans with PTSD or symptoms of PTSD, such as managing symptoms, reducing common comorbid conditions, and eliminating perceived barriers to treatment (Hall et al., 2015; Rosenbaum et al., 2015; Whitworth & Ciccolo, 2016). Due to the known benefits of routine physical activity on mental and physical health (de Assis et al., 2008; Hoge et al., 2004; Watts et al., 2013), it may be beneficial to explore non-pharmacological interventions, such as physical activity, as preventative measure when treating military veterans with PTSD or symptoms of PTSD (Hall et al., 2015; Rosenbaum et al., 2015; Whitworth & Ciccolo, 2016).

Health Belief Model

The Health Belief Model (HBM) was designed to predict if an individual will adopt a health behavior (e.g., physical activity) as a preventive health measure to treat a diagnosed illness (Carpenter, 2010; Eraker et al., 1984; Jones et al., 2014). The HBM theorizes that an individual's readiness to act is based upon six constructs; perceived susceptibility (the patient believes he/she

is susceptible to the illness), perceived severity (the patient believes the illness is serious), perceived benefits (the patient believes taking action will reduce susceptibility to the illness), perceived barriers (the patient believes the positive effects of taking action outweigh the negative effects), self-efficacy (the patient is confident in their ability to take action), and cues to action (the patient is exposed to internal and external motivators) (Pescatello et al., 2014; Rosenstock et al., 1988). Addressing the aforementioned six constructs of the HBM while implementing a recreational physical activity intervention may help motivate a person to become more physically active as well as prevent further health complications associated with PTSD (Pescatello et al., 2014; Rosenstock et al., 1988).

Commonly used strategies for addressing all six constructs in order to promote physical activity are as follows; provide education about potential risk factors associated with a specific illness to change perceived susceptibility, discuss associated costs and behavior outcomes and potential treatment options to change perceived severity, provide education on the overall benefits of physical activity to change perception of benefits, provide education on the benefits of a low-cost physical activity, provide education on different low-cost physical activity options to change perceived barriers, identify potential internal and external motivating factors to improve cues to action, and lastly, assess the persons confidence level for different forms of physical activity and use self-confidence building techniques to increase self-efficacy (Pescatello et al., 2014).

Speer and colleagues (2008) conducted a study based on the HBM to determine if a community-based educational and physical activity program could improve diabetes self-management and A1c among older adults with diabetes. The framework of their intervention incorporated all six constructs of the HBM. To improve perceived susceptibility and severity, researchers provided education to participants that diabetes is common among older adults (Speer et al., 2008). To improve perceived benefits, researcher's educated participants on how to take action and improve self-management (Speer et al., 2008). The researcher's provided educational

information about resources and corrected misinformation to improve participants' perceived barriers (Speer et al., 2008). To improve cues to action, researchers provided recommendations on how to self-manage diabetes (Speer et al., 2008). Researchers presented and reinforced different ways to manage diabetes to improve self-efficacy (Speer et al., 2008).

A systematic review was conducted to evaluate the effectiveness of interventions based upon the theoretical framework of the HBM for improving adherence to health promoting behaviors (Jones et al., 2014). Out of the 18 reviewed studies, 14 reported their intervention was able to statistically improve adherence to health promoting behaviors, such as adherence to medical advice and medication adherence (Jones et al., 2014). The most common techniques utilized to change behavior were providing educational information about health concerns to participants, utilizing a prompt such as a written or verbal script (commonly used together), and facilitating self-reflection (Jones et al., 2014).

More recently, Mo et al. (2016) conducted a study that utilized individuals with mental illness (n = 443) to determine the various health benefits associated with physical activity utilizing the HBM. Authors concluded that self-efficacy was associated with higher physical activity and perception of barriers was associated with a higher level of physical inactivity (Mo et al., 2016). They called for future research to utilize physical activity interventions based on the HBM, and to focus on the constructs of improving self-efficacy and perceived barriers (Mo et al., 2016). Additionally, Castonguay et al. (2016) examined interviews within the HBM among individuals with depression who sought help. Based on the interviews, practical implications for applying interventions based upon the HBM were developed. Implications included focus on reducing uncertainty by targeting the social support system and the individual seeking treatment, promoting external interpersonal cues to action, creating a sense of hope and encouragement, and educating the individual that in order to manage their condition treatment is necessary (Castonguay et al., 2016). Mo and colleagues (2016), determined that in order to improve

adherence to physical activity among individuals with mental illness all six constructs within the HBM should be utilized; however, authors noted that self-efficacy and perceived barriers were the least impactful for changing behavior. After a review of the literature it appears that utilizing all six constructs of the HBM within a physical activity intervention may be able to have a positive impact on a person's physical activity behavior (Pescatello et al., 2014; Rosenstock et al., 1988).

Summary

The rates of PTSD among military veterans are much greater when compared to military veterans without mental health issues (Bourn, Sexton, Porter, & Rauch, 2016) and the general population (Kessler & Ustun, 2008), and are higher in the U.S. than any other country (Kessler et al., 2005; Kessler & Ustun, 2008). Due to the known benefits of physical activity on mental and physical health (Bauman, 2004; Lai et al., 2014; Mente et al., 2009; Penedo & Dahn, 2005), and the lack of literature aimed at analyzing the benefits of physical activity for treating symptom severity of PTSD (Whitworth & Ciccolo, 2016), it may be beneficial to determine if a recreational physical activity intervention designed on the premise of the HBM can serve as an effective mode of treatment for military veterans diagnosed with PTSD (Castonguay et al., 2016; Fitzpatrick et al., 2008; Mirotznik et al., 1995; Mo et al., 2016; Speer et al., 2008). Specifically, recreational physical activity might serve as an invaluable addition to a non-pharmacological treatment plan (Tsatsouli & Fountoulakis, 2006). Considering the major barriers associated with seeking treatment for military veterans, it may be beneficial to identify their perceptions of barriers to participating in recreational physical activity compared to traditional treatments (Hall et al., 2015; Whitworth & Ciccolo, 2016).

CHAPTER III

METHODOLOGY

The purpose of this study was to determine if implementing a recreational physical activity program based on the six constructs of the HBM (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy) could improve symptoms of PTSD among military veterans. The primary researcher had three hypotheses: 1) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will on average have greater improvement of symptoms of PTSD among military veterans when compared veterans who participated in a HBM only intervention, 2) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will on average have greater improvement in cardiovascular endurance among military veterans with symptoms of PTSD when compared to veterans receiving a HBM only intervention, and 3) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will on average have a greater reduction in perceived barriers to treatment for military veterans with symptoms of PTSD when compared to veterans participating in a HBM only intervention.

Participants

Recruitment of participants began in the fall of 2017 and occurred through the Coffee Bunker, which is a pre-established facility that offers various services to veterans living within the community. Military veterans who had symptoms of PTSD as presented in the DSM-5, and were 18 years of age or older were recruited for this study. Recruitment consisted of receiving a signed copy of written approval from the Executive Director of the Coffee Bunker, which provided permission to recruit military veterans who had experienced symptoms of PTSD from their facility (Appendix A). Specific recruitment strategies will be discussed further in the procedures section of this document. Based on a power analysis utilizing G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) the sample size should be a total of 30 participants, 15 in the recreational physical activity and HBM group and 15 in the HBM only group.

After Institutional Review Board (IRB) approval for human subjects' research from Oklahoma State University (Appendix B), an informed consent form (Appendix C) was given to all participants interested in the study. Once informed consent forms' were signed and returned by the participant, prescreening began. To ensure safety and readiness to participate in the HBM recreational physical activity intervention, prescreening of participants occurred through completion of the Physical Activity Readiness Questionnaire (PAR-Q) (Pescatello et al., 2014), which is a questionnaire utilized to determine an individual's readiness to participate in physical activity. Inclusion criteria for this study consisted of participants being at least 18 years of age or older, currently experiencing symptoms of PTSD, and have been an active duty or reserve military personnel in the following branches, Army, Air Force, Marines, Navy, Coast Guard. Exclusion criteria for participation in this research study included the following, any substance and/or alcohol abuse during the intervention, a diagnosed medical condition that would interfere with moving about independently, and/or any active psychosis.

Instrumentation

Demographic Items

Demographic questions (Appendix D) consisted of questions such as, age, gender, race, marital status, branch of military served in, and length of time in service, combat-related experience, duration of combat-related experience, and military position/s held. To ensure the emotional and physical safety of potential participants, they were given the option, but not required to identify the specific trauma to avoid triggering the individual to re-experience the event. Physical activity history questions consisted of asking participants the frequency, intensity (mild, moderate, vigorous), duration, and type (aerobic, anaerobic) of any physical activity they may have engaged in within the past three months. These physical activity questions helped the primary researcher determine which participants should be classified as sedentary (Haskell et al., 2007; Pescatello et al., 2014). If a participant had not engaged in at least 150 minutes of moderate-intensity physical activity or 75 minutes of vigorous-intensity physical activity each week for the past three months, they were classified as sedentary (Haskell et al., 2007; Pescatello et al., 2014).

Barriers to Access to Care Evaluation scale (BACE)

The Barriers to Access to Care Evaluation scale (BACE) is utilized to assess barriers to health seeking behavior for individuals who have mental illness (BACE, 2012; Clement et al., 2012). The BACE assesses variables that can hinder, delay, or deter an individual with a mental illness from seeking professional mental health care, which can be categorized as either a mental health nurse, social worker, psychiatrist, primary care physician, psychologist, or counselor (BACE, 2012; Clement et al., 2012). The BACE can also be used to assess changes among health seeking barriers after an intervention is implemented (BACE 2012; Clement et al., 2012), and for the purposes of this research study, the BACE was utilized to track a change in health seeking

barriers pre and post the HBM recreational physical activity and the HBM only interventions. The BACE should take approximately five minutes to administer and is a 30-item questionnaire (Appendix E) that can be administered either by self-report or through an interview format (BACE, 2012; Clement et al., 2012). Any person working at a university or in a health setting has free access to the scale and is able to administer and interpret the BACE once they have completed the online application (BACE, 2012; Clement et al., 2012). The questionnaire is based on a 0-3 Likert scale rating, where a higher score is indicative of a greater barrier, 0 = "not at all", 1 = "a little", 2 = "quite a lot", and 3 = "a lot" (BACE, 2012; Clement et al., 2012). There is also a 12-item subscale within the BACE that measures stigma related barriers and utilizes the same Likert scale rating of 0-3, where a higher score is indicative of a greater barrier (BACE, 2012; Clement et al., 2012). Questions that are associated with the stigma related barriers are 3, 5, 8, 9, 12, 14, 17, 19, 21, 24, 26, and 28 (BACE, 2012; Clement et al., 2012). Examples of questions are as follows, "have any of these issues ever stopped, delayed, or discouraged you from getting, or continuing with, professional care for a mental health problem: 1) Being unsure where to go to get professional care (BACE, 2012; Clement et al., 2012), 2) Wanting to solve the problem on my own, 3) Concern that I might be seen as weak for having a mental health problem (BACE, 2012; Clement et al., 2012), and 4) fear of being put in hospital against my will" (BACE, 2012; Clement et al., 2012).

For the BACE, two different scores were recorded, 1) the total BACE score for each participant, and 2) the total BACE stigma score for each participant. The BACE has been deemed reliable, valid, and acceptable for use to analyze barriers to access to health care (BACE, 2012; Clement et al., 2012). The weighted kappa values of the BACE (.61 to .80) were indicative that there was test and retest reliability (BACE, 2012; Clement et al., 2012). The reliability of the 12-item treatment stigma subscale, lin's concordance statistic showed that there is excellent test-retest reliability (ρ_c = .816) of the 12-item treatment stigma subscale and Cronbach's alpha was

also indicative of good internal consistency (α = .89) (Clement et al., 2012). Psychometric testing was also indicative that the BACE has good construct validity (*r* = .40) (BACE, 2012; Clement et al., 2012). The Flesch Reading Ease score for the BACE was 78.8, which means that the survey is easy to read and the Flesch-Kincaid Grade Level was 5.9, which means the BACE instrument could be understood by a person as young as 11 or 12 years old, based on these results authors concluded the BACE is an acceptable instrument to administer (BACE 2012; Clement et al., 2012).

Borg Rate of Perceived Exertion

According to the Centers for Disease Control and Prevention (CDC), the Borg Rating of Perceived Exertion Scale (BRPE) (Appendix F) is an indirect way to measure intensity of physical activity and is based on the individual's perception of their heart rate, respiration, sweat, and fatigue (CDC, 2015). The ACSM determined the BRPE is one of the most widely utilized psychophysical categorical scales to determine self-reported physical exertion (Pescatello et al., 2014). While participating in recreational physical activity the individual rated their individual perception of physical exertion, which reflected how intense the activity felt to the individual. The participants were educated on the rating scale, which ranged from the numerical value 6 to 20, where 6 indicated no exertion and 20 indicated maximal exertion (CDC, 2015).

The BRPE has been shown to be a reliable and valid measure (Chen, Fan, & Moe, 2002; Ritchie, 2012). A meta-analysis of 437 studies was conducted by Chen et al. (2002) to examine the relationship between RPE scores and heart rate, blood lactate concentration, maximal oxygen uptake, oxygen uptake, ventilation rate, and respiration rate. Researchers determined the following weighted mean validity coefficients for the six physiological variables utilized were moderate to large heart rate (*r* = .62), blood lactate (*r* = .57), maximal oxygen uptake (*r* = .64), oxygen uptake (*r* = .63), ventilation (*r* = .72), and respiration (*r* = .72) (Chen et al. 2002).

Additionally, Chen et al. (2002) concluded that the BRPE is reliable when utilized among most populations (r = .80-.90).

Cooper 12-minute Test

The Cooper 12-minute Test is a commonly used field test to estimate cardiovascular endurance by estimating VO_2max (Pescatello et al., 2014). The main objective of this cardiovascular field test is to cover the greatest distance possible (walking or running) within a 12 minute time period. A highly cited article by Cooper (1968) conducted a study to determine the correlation between the 12-minute walk/run field test and a laboratory administered test that measured gas-exchange (Cooper, 1968). Participants consisted of Air Force male officers and airmen (n = 115). It was concluded that there was a high correlation between VO_2max and the Cooper 12 minute run/walk test (r = .897) and the "rank maximum VO_2 to rank 12-minute run performance = .90" (Cooper, 1968, p. 137). More recently, a psychometric meta-analysis of 123 studies that examined the criterion-related validity for different field-tests for estimating cardiovascular fitness (among adults and children), the Cooper 12-minute walk/run test had the strongest criterion-related validity (r_p = .78, .72-.83) (Mayorga-Vega, Bocanegra-Parrilla, Ornelas, & Viciana, 2016). Penry, Wilcox, and Yun (2011) conducted a study (n = 60) to determine the reliability of the Cooper 12-minute walk/run test. They utilized a Generalizability Theory Analysis (G-study) and determined the Cooper 12-minute walk/run test demonstrated a high reliability coefficient, φ = .96. Therefore, due to the nature of this research and the resources available the Cooper 12-minute walk/run test was utilized, and served as a reliable and valid submaximal estimate of cardiovascular endurance. The recommended equation by the ACSM was utilized for this research study: VO_2max ($ml \cdot kg^{-1} \cdot min^{-1}$) = 22.351 x distance covered in kilometers–11.288.

Physical Activity Readiness Questionnaire (PAR-Q)

The American College of Sports Medicine's Guidelines for Exercise Testing and Prescription recommends administration of a pre-participation health-screening tool for apparently healthy adults, such as the Physical Activity Readiness Questionnaire (PAR-Q), which is a questionnaire developed for individuals between the ages of 15 to 69 (Appendix G) (Pescatello et al., 2014; Shephard, 1988; Thomas, Reading, & Shepard, 1992). This instrument served as a risk stratification method for detecting cardiovascular risk factors and it simplified the screening process, which helped eliminate any unnecessary and unproven barriers for starting a recreational physical activity intervention (Pescatello et al., 2014; U.S. Department of Health and Human Services (U.S. DHHS), 2008). Therefore, recommending a medical examination or stress test as a pre-participation health screening was not necessary due to the selected population of this research study (Castonguay et al., 2016; Mo et al., 2016; Pescatello et al., 2014).

The PAR-Q is a guided self-report questionnaire that consisted of seven yes or no questions (Pescatello et al., 2014; Shephard, 1988; Thomas et al., 1992). If the potential participant answered yes to one or more questions the participant was excluded from this research study. If the potential participant answered no to all questions, they were included in this research study. Examples of questions are as follows, "Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor? Do you feel pain in your chest when you do physical activity? Do you lose your balance because of dizziness or do you ever lose consciousness?" (Pescatello et al., 2014; Shephard, 1988; Thomas et al., 1992).

PTSD Checklist for Diagnostic and Statistical Manual-5 (PCL-5)

The U.S. DVA (2012) recommends utilizing the PCL-5 (Appendix H) for three primary reasons: to monitor symptoms, to screen for PTSD, and provisional PTSD diagnoses. However, for the purposes of this study, the PCL-5 was utilized to monitor the change of PTSD symptoms

over time. The PCL-5 has been updated to the current DSM-5 symptom criteria for PTSD, and is a 20-item self-report questionnaire based on a 0-4 Likert scale rating. A 0 = "not at all", 1 = "a little bit", 2 = "moderately", 3 = "quite a bit", and 4 = "extremely" (Weathers et al., 2013). Examples of questions include, but not limited to, "in the past month, how much were you bothered by repeated, disturbing, and unwanted memories of the stressful experience," "in the past month, how much were you bothered by repeated, disturbing dreams of the stressful experience," "in the past month, how much were you bothered by blaming yourself of someone else for the stressful experience or what happened after it" (Weathers et al., 2013).

A total symptom severity score was measured at pre and post assessment stages. Scores ranged from 0-80, with higher scores indicating more severe symptoms (Weathers et al., 2013). It has been determined that in order to detect a reliable change in symptom severity, there should be a 5-10 point change, and to have clinically significant change there needs to be a 10-20 point change (Weathers et al., 2013). Additionally, severity scores for each symptom cluster, based on the DSM-5, were determined by adding the scores for questions within a cluster. For example, cluster B symptoms (intrusion symptoms) were represented by questions 1-5, cluster C symptoms (persistent avoidance of stimuli associated with the traumatic event) were represented by questions 6-7, cluster D symptoms (negative alterations in cognitions and mood) were represented by questions 8-14, and cluster E symptoms (hyperarousal) were represented by questions 15-20 on the PCL-5 (APA, 2016; Weathers et al., 2013). The questionnaire took between 5-10 minutes for participants to complete (U.S. DVA, 2012; Weathers et al., 2013)

Psychometric testing has occurred multiple times to identify the reliability and validity of the PCL-5. Initial psychometric testing conducted on college students exposed to trauma involved a two phase study to determine reliability (e.g., internal consistency and test-retest) and validity (e.g., convergent and discriminant) (Blevins, Weathers, Davis, Witte, & Domino, 2015). In addition, Blevins et al. (2015) conducted confirmatory factor analysis to determine how well the

items fit the subscales. Between the two phases of testing, Blevins et al. (2015), reported the PCL-5 has high internal consistency, good test-retest reliability (r = .82, 95% CI [.71, .89]), and good internal consistency at item level. The PCL-5 had strong correlations with the Posttraumatic Stress Disorder checklist (PCL) (rs = .85), Posttraumatic Stress Diagnostic Scale (PDS) (rs = .85), and Detailed Assessment of Posttraumatic Stress (DAPS) (rs = .84), all p = .01. Each of the measures used to determine convergent validity have demonstrated strong or excellent reliability and validity (Blevins et al., 2015, p. 491). Results supported discriminant validity with related constructs (e.g., depression, r = .60) and least strongly with measures of unrelated constructs (e.g., mania, r = .31 and antisocial personality, r = .39). Confirmatory factor analyses

> indicated superior fit the 6-factor, χ^2 (164) = 318.87, p < .001, SRMR = .05, RMSEA = .06, CFI = .9, and TLI = .90, and 7-factor, χ^2 (164) = 291.32, p < .001, SRMR = .05, RMSEA = .06, CFI = .93, and TLI = .91, models. (Blevins et al., 2015, p. 489)

Additional psychometric testing was conducted to determine the validity, reliability, and confirmatory factor analysis of the PCL-5 among active military service members and veterans (Bovin et al., 2016; Wortman et al., 2016). Bovin et al. (2016) tested psychometric properties for the PCL-5 among military veterans (n = 468). Results were indicative of excellent internal consistency (α = .96) and good test-retest reliability (r = .84) (Bovin et al., 2016). Excellent convergent validity (r = .87) when measured against the Posttraumatic Checklist–Civilian (PCL-C), and discriminant validity demonstrated weaker correlations with scores on measures of alcohol abuse (r = .14) and psychopathy (r = .08) (Bovin et al., 2016). "Confirmatory factor analysis revealed that the data were best explained by a 6-factor anhedonia model and a 7-factor hybrid model" (Bovin et al., 2016, p. 1379). Finally, Bovin et al. (2016) validated the PCL-5 against the DSM-5 version of the Clinician-Administered PTSD Scale (CAPS), which is considered the gold standard for diagnosing PTSD, to establish a valid cutoff score. "Signal

detection analyses using the CAPS-5 revealed that PCL-5 scores of 31 to 33 were optimally efficient for diagnosing PTSD (κ(.5) = .58)" (Bovin et al., 2016, p. 1379).

Most recently, Wortman et al. (2016) conducted a psychometric analysis of the PCL-5 among military service members seeking treatment for PTSD (n = 912). They tested internal consistency, convergent and discriminant validity, and DSM-5 factor structure of PCL-5 scores. Results were high overall internal consistency (α = .95), good convergent validity compared with the Posttraumatic Checklist–Specific (PCL)-S (*r* = .87), and discriminant validity demonstrated weaker scores with Alcohol use disorders identification test (*r* = .10). A 7-factor hybrid model, χ^2 (148) = 604.71, *p* < .001, SRMR = .04, RMSEA = .06, CFI = .94, and TLI = .92, was the best-fitting model (Wortman et al., 2016, p. 8). In addition, cut scores identified in this study a score of 31 on the PCL-5 had optimum agreement with a PCL-S score of 44 (κon t = .74), which are consistent with cut scores presented in Bovin and colleagues study. Based on the above findings, it may be concluded the PCL-5 is a valid and reliable measure for detecting severity of symptoms among military veterans with the diagnosis of PTSD.

Procedures

Institutional Review Board (IRB) approval for human subjects' research from Oklahoma State University approved implementation of this study. Recruitment of participants took place through the Coffee Bunker, which is a pre-established community center for military veterans located in Tulsa, Oklahoma. Written permission was received from the Executive Director of the Coffee Bunker to recruit participants for this research study (Appendix A). Recruitment consisted of written recruitment letter that was sent out to all veterans through an email blast (Appendix I), a written script was presented verbally at the Coffee Bunker to various activity groups (Appendix J), and posted flyers at the Coffee Bunker (Appendix K). After the recruitment process, potential participants who completed and returned an informed consent form and met the aforementioned

inclusion criteria participated in the study. Prescreening included the PAR-Q, and if participants answered yes to one of seven questions, they were excluded from this research study.

Participants were randomly assigned to the experimental group (HBM recreational physical activity) or a comparison group (HBM only) (Suresh, 2011). Participant codes were input into an excel sheet and an additional column was utilized to randomize participants. A column was created in excel labeled Random and the code =rand() was used as a function that created a random value. Once participants received a random number, the data was sorted by random numbers from least to greatest. Participants were then placed into groups based on their random number, for example, the first five numbers in excel were included in the experimental group, and the second four numbers were placed in the comparison group.

Baseline assessments were completed approximately one week prior to the start of study, and included the demographic questionnaire, the PCL-5, the BACE, and the Cooper 12-minute walk/run test. Post assessments were completed approximately one week after either 4-week intervention and included the PCL-5, the BACE, and the Cooper 12-minute walk/run test. The intervention consisted of a four-week moderate-intensity recreational physical activity regimen based on the theoretical framework of the HBM, which had the participants meet the national recommendations for physical activity. The recreational physical activity consisted of the participants engaging in a walking group that met at a park located near the Coffee Bunker. The participants in the recreational physical activity and Health Belief Model group (n = 5) participated in two 60 minute group sessions per week for four weeks, where there was 15 minutes of leisure education, 30 minutes of walking at a moderate-intensity, and an additional 15 minutes of leisure education at the end of the sessions. Both leisure education portions of the intervention focused on processing questions based on the Health Belief Model's six constructs regarding their PTSD symptoms. Since the physical activity recommendations are to meet 150 minutes of moderate-intensity physical activity per week, the participants completed the

remaining 90 minutes of moderate-physical activity independently throughout each week, participants were required to keep a physical activity log to document all weekly physical activity (Appendix L). Participants in the Health Belief Model only group (n = 5) participated in two 30-minutes group sessions per week, discussing the Health Belief Model's six constructs in regard to their PTSD symptoms and physical activity for four weeks.

The HBM recreational physical activity group participated in an educational session before the intervention started, which focused on understanding how to rate their individual perception of physical exertion, which was a reflection of how intense the activity felt to the individual (CDC, 2015; Pescatello et al., 2014). The participants were educated on the rating scale, which ranges from the numerical value 6 to 20, where 6 indicates no exertion and 20 indicates maximal exertion (CDC, 2015). The primary researcher educated the participants that a rating of six is equivalent to experiencing 'no exertion at all', a rating of nine is equivalent to 'very light' and can be thought of as walking slowly at a self-selected pace, a rating of 13 is equivalent to 'somewhat hard' and can be thought of as exercising but feeling okay to continue, a rating of 17 is equivalent to 'very hard' and can be thought of as strenuous exercise where an apparently healthy person is very tired during exercise but if they push hard enough they can continue on, and a score of 19 is equivalent to 'extremely hard' and can be thought of as extremely strenuous or vigorous exercise and that for apparently healthy persons the exercise/activity cannot be sustained for very long (CDC, 2015; Pescatello et al., 2014). Participants used the rating scale of 6 to 20 (where 6 equals no exertion and 20 equal's maximum exertion) and engaged in an exertion level of "somewhat hard", which is comparable to moderate-intensity physical activity (12-14) (Haskell et al., 2007; Pescatello et al., 2014).

The processing questions utilized concepts from the HBM and was addressed each week during the interventions and used as a strategy to change behavior (e.g., continue to engage in physical activity post-intervention or increase physical activity) (see Table 1). The processing

questions were designed to reflect the same content in both of the experimental and control groups. The first construct addressed was perceived susceptibility (the patient believes he/she is susceptible to the illness), the second construct was perceived severity (the patient believes the illness is serious), the third construct was perceived benefits (the patient believes taking action will reduce susceptibility to the illness), the fourth construct was perceived barriers (the patient believes the positive effects of taking action outweigh the negative effects), the fifth construct was self-efficacy (the patient is confident in their ability to take action), and the sixth construct to be addressed was cues to action (the patient is exposed to internal and external motivators) (Pescatello et al., 2014; Rosenstock et al., 1988). Processing and instruction based on each of the HBM constructs occurred during warm-up and cool-down portions of the recreational physical activity.

Table 1. Time-line of HBM Constructs

	Perceived Susceptibility/cues to action	**Perceived Severity/self-efficacy**	**Perceived Benefits/cues to action**	**Perceived Barriers/self-efficacy**
Week 1	X			
Week 2		X		
Week 3			X	
Week 4				X

Statistical Analysis

This study examined whether a HBM recreational physical activity intervention would on average improve symptoms of PTSD among military veterans. There were three null hypotheses, 1) a four-week recreational physical activity intervention combined with components of HBM and 150 minutes of moderate-intensity recreational physical activity per week on average will not have greater improvements in symptoms of PTSD among military veterans compared with military veterans participating in an HBM only intervention, 2) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week on average will not have greater improvement in cardiovascular endurance among military veterans with symptoms of PTSD compared with military veterans participating in an HBM only intervention , and 3) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week on average will not have a greater reduction in perceived barriers to treatment for military veterans with symptoms of PTSD participating in an HBM only intervention.

The independent variables were time (pre/post) and group (treatment/control). The dependent variables were severity of PTSD symptoms (PCL-5), the BACE, and cardiovascular fitness (Cooper 1-mile walk/run test).

Data was analyzed using SPSS version 22.0. A Repeated Measures ANOVA was utilized to test the null hypotheses for each dependent variable ($\alpha = .05$). Independent samples *t*-tests were conducted to examine baseline differences between group means. Descriptive statistics including examination of outliers, and normality and homogeneity were conducted for each dependent variable and effect size calculations were conducted to detect meaningful results from potentially non-significant results.

Assumptions of the repeated measures ANOVA test are data is on a parametric scale or interval/ratio, normality of data, homogeneity of variance, sphericity holds, and independence of data, and that there are no outliers (Berg & Latin, 2008; Vincent & Weir, 2012). Normality of data was checked by plotting a histogram, checking for skewness/kurtosis, analyzed Q-Q plot, and Shapiro Wilk's test. Analyzing Levene's test and a scatterplot of residuals was conducted to determine homogeneity of variance. Independence of data was checked by making sure all participants are randomly assigned to separate groups and by also checking a scatterplot of residuals.

CHAPTER IV

RESULTS

Purpose

The purposes of this research study were to (1) determine if a four-week recreational physical activity intervention combined with components of the HBM could on average serve as an efficient modality to treat symptoms of PTSD among military veterans when compared to a four-week intervention based only on components of the HBM; (2) determine if a four-week recreational physical activity intervention combined with components of the HBM can on average improve cardiovascular health among military veterans with symptoms of PTSD compared to a four-week intervention based only on components of the HBM; (3) and to determine if a four-week recreational physical activity intervention combined with HBM could on average reduce perceived barriers to treatment compared to a four-week intervention based only on components of the HBM.

Descriptive Statistics

Initially 12 participants agreed to participate in this research study; however, one did not meet inclusion criteria, one dropped out in the second week of the intervention, and the third participant dropped out after pre-testing data. Therefore, the total number of participants with usable information was nine individuals (6 males and 3 females) that participated in this research study (Figure 1).

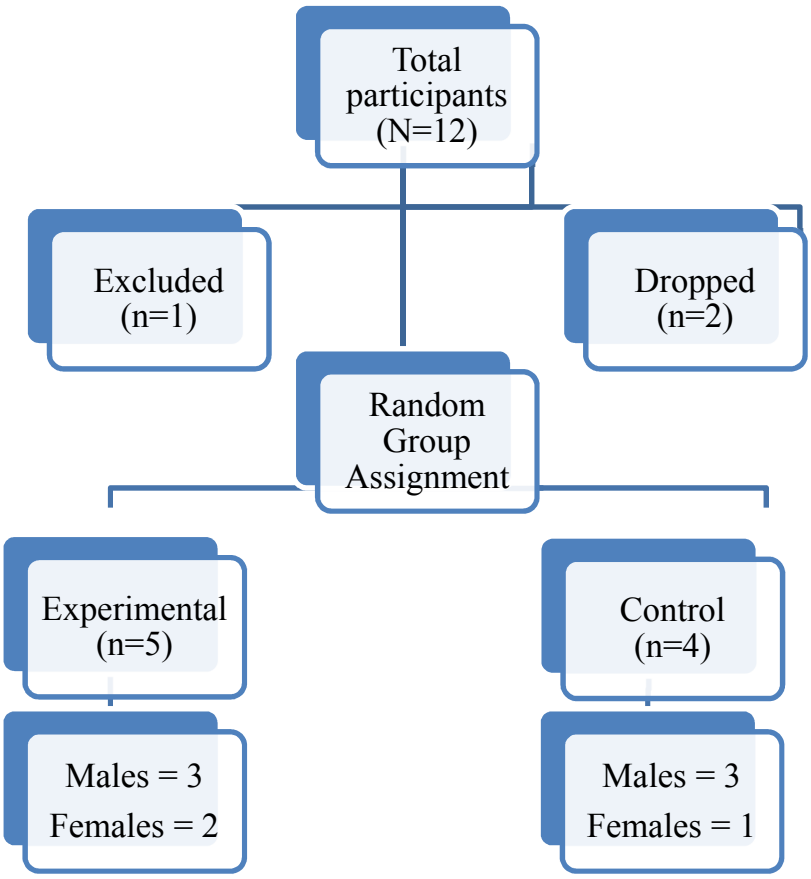

Figure 1. Participant Flow Chart

Participants were randomly assigned to one of two groups; treatment group (n = 5) and control group (n = 4). The treatment group included two females and three males, and the control group included three males and one female. The average ages of all participants were 43.67 ± 21.7 *SD*, with the youngest participant at 24 years old and the oldest participant was 73 years old. The average length of active duty for all participants was 34.44 ± 21.226 *SD* months, with the shortest length served being 18 months and the longest length served being 84 months. The average numbers of deployments were 1.44 ± 1.01 *SD*, with ranges from one to four. The average length of deployment was 11.78 ± 9.431 *SD* months, ranging from the shortest total months deployed being six months to the longest total months deployed being 36 months. Participants were representative of four different military branches, Airforce (n = 1), Army (n = 3), Marines (n

= 3), and Navy (n = 2). Participants were physically active for an average of 2.56 ± 1.87 *SD* days per week with an average of 31.11 ±13.64 *SD* minutes of physical activity per active session. Out of both groups, 77.8% (n = 7) were classified as sedentary (participants did not meet 150 minutes of moderate-intensity physical activity per week) and 22.2% (n = 2) were classified as non-sedentary (participants did meet 150 minutes of moderate-intensity physical activity per week), according to the American Heart Association and the American College of Sports Medicine (Haskell et al., 2007; Pescatello et al., 2014).

All assumptions of the repeated measures ANOVA were tested. All data analyzed were parametric. Normality of data were tested by first analyzing skewness and kurtosis and then utilizing the Shapiro-Wilk test. Skewness and kurtosis violated the range of ± 1; therefore, the Shapiro Wilk test was utilized, all variables significance levels were $p > .05$ with the exception of the control group estimated VO_2max score ($p < .001$), indicating all data were normally distributed (with the exception of the control group estimated VO_2max) (Table 2). Since only one group (estimated VO_2max control group) out of all variables were not normally distributed, no corrections were made because the ANOVA F test statistic is robust (Berg & Latin, 2008; Vincent & Weir, 2012). Homogeneity of variance was tested by analyzing Levene's Test of Equality of Variances. There were no statistically significant results, indicating equal variances across samples (Table 3), the assumption was not violated ($p > .05$) (Berg & Latin, 2008; Vincent & Weir, 2012). Assumption of independence held because all individuals were randomly assigned to the experimental or control groups. There were outliers within five variables found within the treatment group for pre-test measurements, and four outliers found within the treatment group for post-test measurements. There were no outliers within the control group for pre- or post-test measurements. Outliers were not removed because the ANOVA test statistic is robust (Berg & Latin, 2008; Vincent & Weir, 2012), and because they were true measures and important for accurate representation of the population.

Table 2. *Shapiro-Wilk's Test for Normality of Data*

		t	df	Significance
PCL_total				
	Treatment	0.912	4	0.492
	Control	0.878	5	0.299
PCL_Cluster B				
	Treatment	0.859	5	0.223
	Control	0.979	4	0.894
PCL_Cluster C				
	Treatment	0.881	5	0.314
	Control	0.863	4	0.272
PCL_Cluster D				
	Treatment	0.908	5	0.453
	Control	0.827	4	0.161
PCL_Cluster E				
	Treatment	0.86	5	0.228
	Control	0.729	4	0.024
BACE_total				
	Treatment	0.932	5	0.607
	Control	0.981	4	0.906
BACE_Stigma				
	Treatment	0.97	5	0.875
	Control	0.963	4	0.796
Estimated VO_2max				
	Treatment	0.836	5	0.154
	Control	0.63	4	.001*

Table 3. *Levene's of Test of Equality Variances*

	n	F	df	Significance
PCL_total				
	9	0.171	1, 7	0.692
PCL_Cluster B				
	9	2.494	1, 7	0.158
PCL_Cluster C				
	9	4.181	1, 7	0.08
PCL_Cluster D				
	9	0.645	1, 7	0.448
PCL_Cluster E				
	9	1.75	1, 7	0.227
BACE_total				
	9	0.301	1, 7	0.6
BACE_Stigma				
	9	0.008	1, 7	0.933
Estimated VO_2max				
	9	0.053	1, 7	0.824

PCL-5. Descriptive statistics, effect size calculations, and percent change were calculated for the PCL-5 between groups for pre- and post-testing analyses (Table 4, Figure 2).

Table 4.
Descriptive Statistics, Effect Size, and percent Change of all Dependent Variables

			Pre-Testing		Post-Testing				
		N	Mean	SD	Mean	SD	Mean Diff	ES	%Δ
PCL_total									
	Treatment	5	55.2	5.93	43.8	6.34	11.4	-1.92242833	-20.65%
	Control	4	53.5	4.04	47.25	6.18	6.25	-1.5470297	-11.68%
	Total	9	54.44	4.95	45.33	6.144	9.11	-1.84	-16.73%
PCL_Cluster B									
	Treatment	5	9.8	1.92	7.4	1.67	2.4	-1.25	-24.49%
	Control	4	11.25	3.5	9.75	2.87	1.5	-0.42857143	-13.33%
	Total	9	10.44	2.65	8.44	2.45	2	-0.75	-19.16%
PCL_Cluster C									
	Treatment	5	5.2	0.84	4	1.23	1.2	-1.42857143	-23.08%
	Control	4	4.5	1.91	4	1.63	0.5	-0.2617801	-11.11%

	Total	9	4.89	1.36	4	1.32	0.89	-0.65	-18.20%
PCL_Cluster D									
	Treatment	5	21	1.87	17	2.45	4	-2.13903743	-19.05%
	Control	4	21.25	2.06	19.5	1.73	1.75	-0.84951456	-8.24%
	Total	9	21.11	1.83	18.11	2.421	3	-1.64	-14.21%
PCL_Cluster E									
	Treatment	5	19.2	2.28	15.4	2.89	3.8	-1.66666667	-19.79%
	Control	4	16.5	0.57	14	2.45	2.5	-4.38596491	-15.15%
	Total	9	18	2.18	14.78	2.63	3.22	-1.48	-17.89%
BACE_total									
	Treatment	5	60.8	4.39	45.4	6.99	15.4	-3.50797267	-19.79%
	Control	4	63.5	5.19	55.75	8.8	7.75	-1.49325626	-12.20%
	Total	9	62	4.66	50	9.12	12	-2.58	-19.35%
BACE_Stigma									
	Treatment	5	28.8	4.32	21.6	5.13	7.2	-1.66666667	-25.00%
	Control	4	28.25	4.03	25	5.48	3.25	-0.80645161	-11.50%
	Total	9	28.56	3.94	23.11	5.25	5.45	-1.38	-19.08%
Estimated VO_2max									
	Treatment	5	20.72	8.37	30.08	13.34	-9.36	1.1182796	45.17%
	Control	4	28.73	9.89	34.57	11.52	-5.84	0.5904954	20.33%
	Total	9	24.28	9.46	32.07	12.01	-7.79	0.82	32.08%

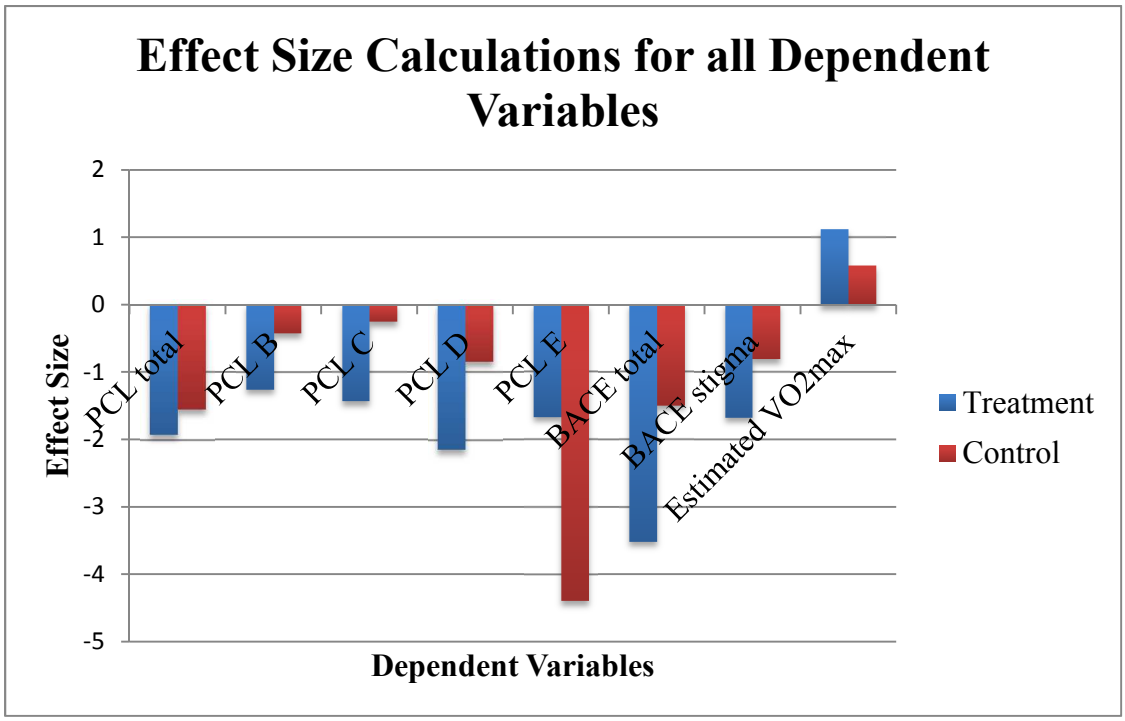

Figure 2. Comparison of effect size numbers between groups

Treatment. Pre-testing numbers for the treatment group included a mean and standard deviation of 55.2 ± 5.93. There were two outliers found within pre-testing measurement of the treatment group. Post-testing numbers for the treatment group included a mean and standard deviation of 43.8 ± 6.34. There were no outliers found within post-testing measurement of the treatment group.

Control. Pre-testing numbers for the control group included a mean and standard deviation of 53.50 ± 4.04. There were no outliers found within pre-testing measurement of the control group. Post-testing numbers for the control group included a mean and standard deviation of 47.25 ± 6.185. There were no outliers found within post-testing measurement of the control group.

PCL-5, Cluster B. Descriptive statistics were calculated for the PCL-5 Cluster B between groups for pre- and post-testing analyses (Table 4).

Treatment. Pre-testing numbers for the treatment group included a mean and standard deviation of 9.80 ± 3.5. There was one outlier found within pre-testing measurement of the treatment group. Post-testing numbers for the treatment group included a mean and standard deviation of 7.40 ± 1.67. There were no outliers found within post-testing measurement of the treatment group.

Control. Pre-testing numbers for the control group included a mean and standard deviation of 11.25 ± 3.5. There were no outliers found within pre-testing measurement of the control group. Post-testing numbers for the control group included a mean and standard deviation of 9.75 ± 2.87. There were no outliers found within post-testing measurement of the control group.

PCL-5, Cluster C. Descriptive statistics were calculated for the PCL-5 Cluster C between groups for pre- and post-testing analyses (Table 4).

Treatment. Pre-testing numbers for the treatment group included a mean and standard deviation of 5.20 ± 0.84. There was one outlier found within pre-testing measurement of the treatment group. Post-testing numbers for the treatment group included a mean and standard deviation of 4.00 ± 1.23. There was one outlier found within post-testing measurement of the treatment group.

Control. Pre-testing numbers for the control group included a mean and standard deviation of 4.50 ± 1.91. There were no outliers found within pre-testing measurement of the control group. Post-testing numbers for the control group included a mean and standard deviation of 4.00 ± 1.63. There were no outliers found within post-testing measurement of the control group.

PCL-5, Cluster D. Descriptive statistics were calculated for the PCL-5 Cluster D between groups for pre- and post-testing analyses (Table 4).

Treatment. Pre-testing numbers for the treatment group included a mean and standard deviation of 21.00 ± 1.87. There was one outlier found within pre-testing measurement of the treatment group. Post-testing numbers for the treatment group included a mean and standard deviation of 17.00 ± 2.45. There was one outlier found within post-testing measurement of the treatment group.

Control. Pre-testing numbers for the control group included a mean and standard deviation of 21.25 ± 2.06. There were no outliers found within pre-testing measurement of the control group. Post-testing numbers for the control group included a mean and standard deviation of 19.50 ± 1.73. There were no outliers found within post-testing measurement of the control group.

PCL-5, Cluster E. Descriptive statistics were calculated for the PCL-5 Cluster E between groups for pre- and post-testing analyses (Table 4).

Treatment. Pre-testing numbers for the treatment group included a mean and standard deviation of 19.20 ± 2.28. There was one outlier found within pre-testing measurement of the treatment group. Post-testing numbers for the treatment group included a mean and standard deviation of 15.40 ± 2.89. There was one outlier found within post-testing measurement of the treatment group.

Control. Pre-testing numbers for the control group included a mean and standard deviation of 16.50 ± 0.577. There were no outliers found within pre-testing measurement of the control group. Post-testing numbers for the control group included a mean and standard deviation of 19.50 ± 1.73. There were no outliers found within post-testing measurement of the control group.

BACE. Descriptive statistics were calculated for the BACE between groups for pre- and post-testing analyses (Table 4).

Treatment. Pre-testing numbers for the treatment group included a mean and standard deviation of 60.80 ± 4.38. There were two outliers found within pre-testing measurement of the treatment group. Post-testing numbers for the treatment group included a mean and standard deviation of 45.40 ± 6.99. There was one outlier found within post-testing measurement of the treatment group.

Control. Pre-testing numbers for the control group included a mean and standard deviation of 63.50 ± 5.19. There were no outliers found within pre-testing measurement of the control group. Post-testing numbers for the control group included a mean and standard deviation of 55.75 ± 8.81. There were no outliers found within post-testing measurement of the control group.

BACE, Stigma subscale. Descriptive statistics were calculated for the BACE stigma subscale, between groups for pre- and post-testing analyses (Table 4).

Treatment. Pre-testing numbers for the treatment group included a mean and standard deviation of 28.80 ± 4.32. There were two outliers found within pre-testing measurement of the treatment group. Post-testing numbers for the treatment group included a mean and standard deviation of 21.60 ± 5.13. There were two outliers found within post-testing measurement of the treatment group.

Control. Pre-testing numbers for the control group included a mean and standard deviation of 28.25 ± 4.03. There were no outliers found within pre-testing measurement of the control group. Post-testing numbers for the control group included a mean and standard deviation of 25.00 ± 5.48. There were no outliers found within post-testing measurement of the control group.

EstimatedVO_2max. Descriptive statistics were calculated for estimated VO_2max between groups for pre- and post-testing analyses (Table 4).

Treatment. Pre-testing numbers for the treatment group included a mean and standard deviation of 20.72 ± 8.38. There were no outliers found within pre-testing measurement of the treatment group. Post-testing numbers for the treatment group included a mean and standard deviation of 30.07 ± 13.34. There were no outliers found within post-testing measurement of the treatment group.

Control. Pre-testing numbers for the control group included a mean and standard deviation of 28.73 ± 9.89. There were no outliers found within pre-testing measurement of the control group. Post-testing numbers for the control group included a mean and standard deviation of 34.57 ± 11.52. There were no outliers found within post-testing measurement of the control group.

Baseline Differences

Independent *t*-Tests. Independent *t*-tests were calculated to determine if there were significant differences between the treatment group and control group at baseline for all dependent variables. Statistical analyses indicated there were no significant differences between groups in respect to all dependent variables; PCL-5 total score, PCL-5 cluster B, PCL-5 cluster C, PCL-5 cluster D, PCL-5 cluster E, BACE total score, BACE stigma score, and estimated VO_2max ($p > .05$; Table 5).

Table 5. Baseline Comparisons for all Dependent Variables

	n	*t*	*df*	Significance
PCL_total	9	0.487	7	0.641
PCL_Cluster B	9	-0.797	7	0.452
PCL_Cluster C	9	0.743	7	0.482
PCL_Cluster D	9	-0.191	7	0.854
PCL_Cluster E	9	2.281	7	0.057
BACE_total	9	-0.848	7	0.425
BACE_Stigma	9	0.195	7	0.851
Estimated VO_2max	9	-1.317	7	0.229

Repeated Measures Analysis of Variance

The hypothesis stated that the recreational physical activity and health belief model treatment group would on average significantly improve symptom severity of PTSD, barriers to health seeking behavior, and cardiovascular health among military veterans when compared to

the health belief model only control group. It was also hypothesized that there would be on average a significant difference between groups at post-testing. The dependent variables were PCL-5 total score, PCL-5 Cluster B, PCL-5 Cluster C, PCL-5 Cluster D, PCL-5 Cluster E, BACE total score, BACE stigma, and estimated VO_2max.

PCL-5 total score. A 2 X 2 repeated measures ANOVA was calculated to examine the time by group interaction and the main effect for the group (Table 6, Figure 2). There was not a significant time * group interaction, $F(1, 7) = 3.127$, $p = .120$. The main effect for time was significant, $F(1, 7) = 2.4$, $p = .001$. The main effect for group was not significant $F(1, 7) = .060$, $p = .814$ indicating the PCL-5 total score was only influenced by time. Effect size and percent change were calculated to detect potentially meaningful results from non-statistically significant results. In the treatment group, Cohen's effect size was calculated as a large effect ($d = 1.92$) and percent change was calculated as a -20.65% decrease. In the control group for the same dependent variable, Cohen's effect size was calculated as a large effect ($d = -1.54$) and percent change was calculated as a -11.68% decrease (Table 4, Figure 10).

Table 6.
Results of Repeated Measures Analysis of Variance for PCL_total

		Between Subjects Effects		
		df	*F*	*p*
PCL_total				
	Group	1	0.06	0.814
	Error	7		
		Within Subjects Effects		
		df	*F*	*p*
PCL_total				
	Time	1	36.725	0.001**
	Time x Group	1	3.127	0.12
	Error	7		

Note. ** = significance at the $p < .001$ level

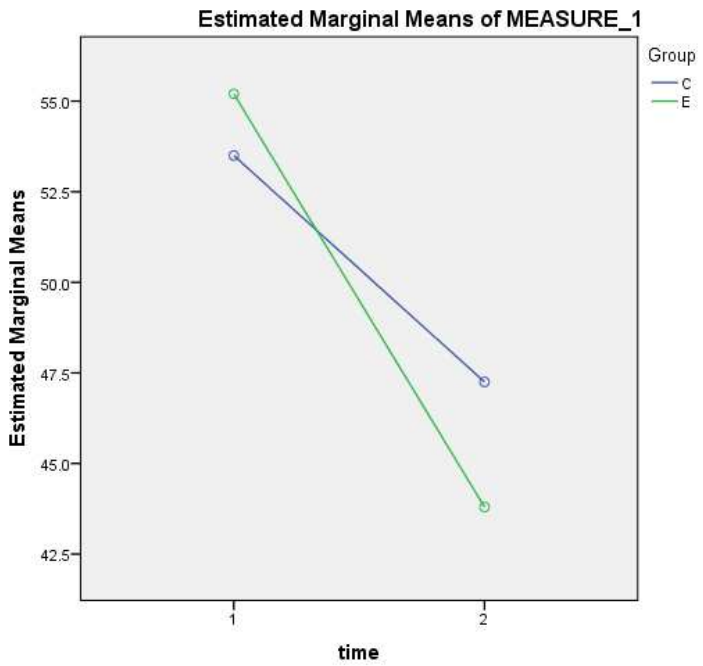

Figure 3. Estimated marginal means and interaction of PCL_total scores over time

PCL-5, Cluster B. A 2 X 2 repeated measures ANOVA was calculated to examine the time by group interaction and the main effect for the group (Table 7, Figure 3). There was not a significant time * group interaction, $F(1, 7) = 1.033$, $p = .343$. The main effect for time was significant, $F(1, 7) = 19.393$, $p = .003$. The main effect for group was not significant $F(1, 7) = 1.380$, $p = .279$; the PCL-5 Cluster B variable was only influenced by time. Effect size and percent change were calculated to detect potentially meaningful results from non-statistically significant results. In the treatment group, Cohen's effect size was calculated as a large effect ($d = 1.25$) and percent change was calculated as a -24.49% decrease. In the control group for the same dependent variable, Cohen's effect size was calculated as a moderate effect ($d = .42$) and percent change was calculated as a -13.33% decrease (Table 4, Figure 10).

Table 7.

Results of Repeated Measures Analysis of Variance for PCL_Cluster B

		Between Subjects Effects		
		df	*F*	*p*
PCL_Cluster B				
	Group	1	1.38	0.279
	Error	7		
		Within Subjects Effects		
		df	*F*	*p*
PCL_Cluster B				
	Time	1	19.39	0.003*
	Time x Group	1	1.033	0.343
	Error	7		

Note. * = significance at the $p < .05$ value

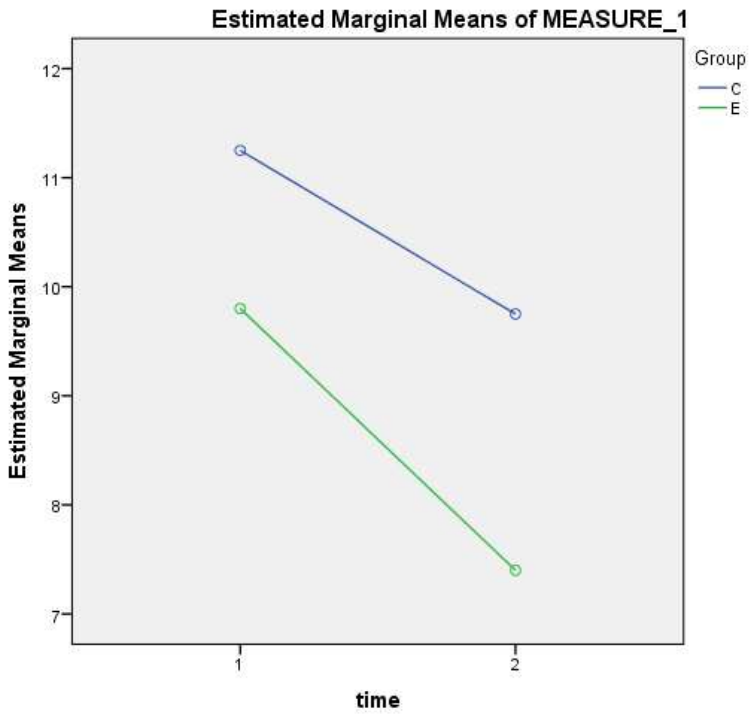

Figure 4. Estimated marginal means and interaction of PCL_Cluster B scores over time

PCL-5, Cluster C. A 2 X 2 repeated measures ANOVA was calculated to examine the time by group interaction and the main effect for the group (Table 8, Figure 4). There was not a

significant time * group interaction, $F(1, 7) = 1.314$, $p = .289$. The main effect for time was significant, $F(1, 7) = 7.75$, $p = .027$. The main effect for group was not significant $F(1, 7) = .153$, $p = .707$; the PCL-5 Cluster C variable was only influenced by time. Effect size and percent change were calculated to detect potentially meaningful results from non-statistically significant results. In the treatment group, Cohen's effect size was calculated as a large effect ($d = 1.42$) and percent change was calculated as a -23.08% decrease. In the control group for the same dependent variable, Cohen's effect size was calculated as a small effect ($d = .26$) and percent change was calculated as a -11.11% decrease (Table 4, Figure 10).

Table 8.

Results of Repeated Measures Analysis of Variance for PCL_Cluster C

		Between Subjects Effects		
		df	*F*	*p*
PCL_Cluster C				
	Group	1	0.153	0.707
	Error	7		
		Within Subjects Effects		
		df	*F*	*p*
PCL_Cluster C				
	Time	1	7.751	.027*
	Time x Group	1	1.314	0.289
	Error	7		

Note. * = significance at the $p < .05$ value

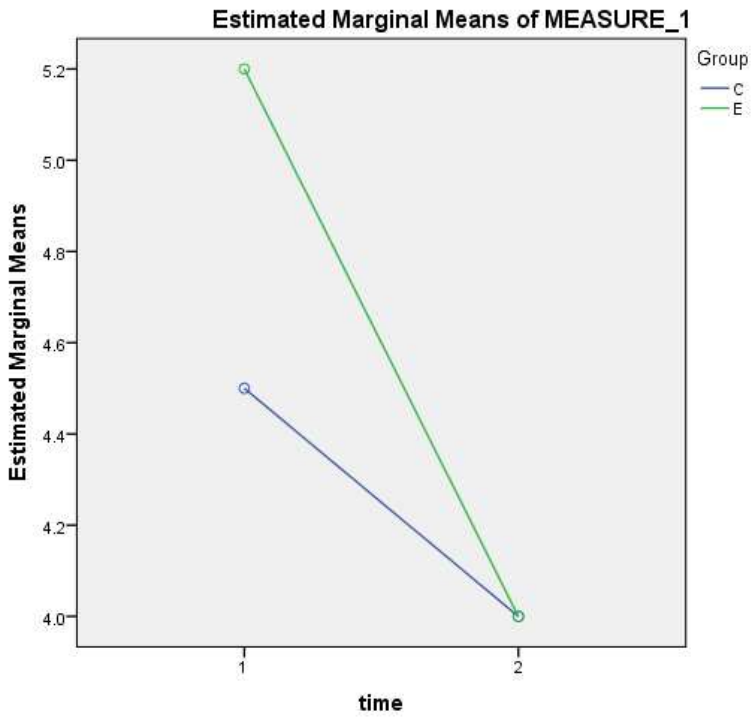

Figure 5. Estimated marginal means and interaction of PCL_Cluster C scores over time

PCL-5, Cluster D. A 2 X 2 repeated measures ANOVA was calculated to examine the time by group interaction and the main effect for the group (Table 9, Figure 5). There was not a significant time * group interaction, $F(1, 7) = 2.032$, $p = .197$. The main effect for time was significant, $F(1, 7) = 13.272$, $p = .008$. The main effect for group was not significant $F(1, 7) = 1.457$, $p = .267$; the PCL-5 Cluster D variable was only influenced by time. Effect size and percent change were calculated to detect potentially meaningful results from non-statistically significant results. In the treatment group, Cohen's effect size was calculated as a large effect ($d = 2.13$) and percent change was calculated as a -19.05% decrease. In the control group for the same dependent variable, Cohen's effect size was calculated as a large effect ($d = .84$) and percent change was calculated as a -8.24% decrease (Table 4, Figure 10)

Table 9.

Results of Repeated Measures Analysis of Variance for PCL_Cluster D

		Between Subjects Effects		
		df	*F*	*p*
PCL_Cluster D				
	Group	1	1.457	0.267
	Error	7		
		Within Subjects Effects		
		df	*F*	*p*
PCL_Cluster D				
	Time	1	13.272	.008*
	Time x Group	1	2.032	0.197
	Error	7		

Note. * = significance at the $p < .05$ value

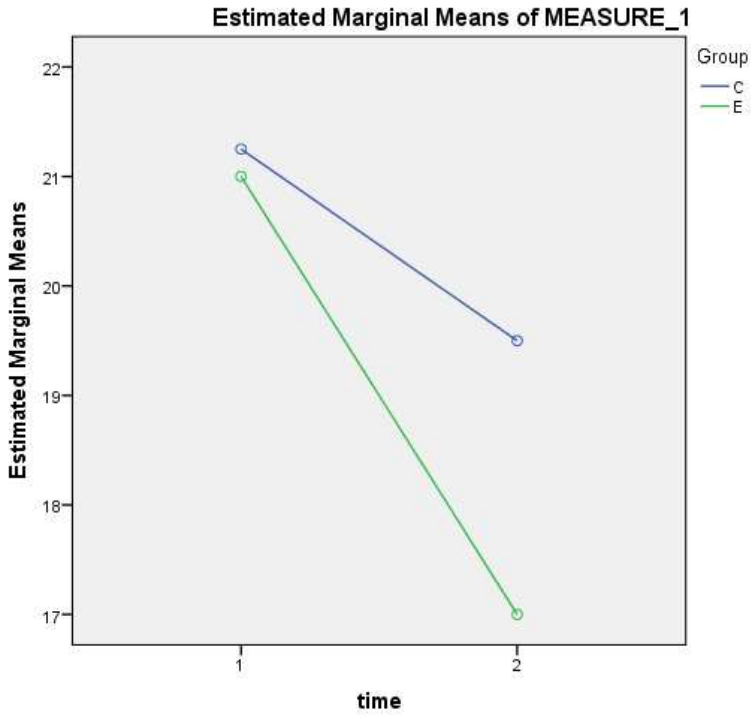

Figure 6. Estimated marginal means and interaction of PCL_Cluster D scores over time

PCL-5, Cluster E. A 2 X 2 repeated measures ANOVA was calculated to examine the time by group interaction and the main effect for the group (Table 10, Figure 6). There was not a significant time * group interaction, $F(1, 7) = 1.019$, $p = .346$. The main effect for time was significant, $F(1, 7) = 23.930$, $p = .002$. The main effect for group was not significant $F(1, 7) = 2.175$, $p = .184$; the PCL-5 Cluster E variable was only influenced by time. Effect size and percent change were calculated to detect potentially meaningful results from non-statistically significant results. In the treatment group, Cohen's effect size was calculated as a large effect ($d = 1.67$) and percent change was calculated as a -19.79% decrease. In the control group for the same dependent variable, Cohen's effect size was calculated as a large effect ($d = 4.38$) and percent change was calculated as a -15.15% decrease (Table 4, Figure 10).

Table 10.

Results of Repeated Measures Analysis of Variance for PCL_Cluster E

		Between Subjects Effects		
		df	F	p
PCL_Cluster E				
	Group	1	2.175	0.184
	Error	7		
		Within Subjects Effects		
		df	*F*	*p*
PCL_Cluster E				
	Time	1	23.93	.002*
	Time x Group	1	1.019	0.346
	Error	7		

Note. * = significance at the $p < .05$ value

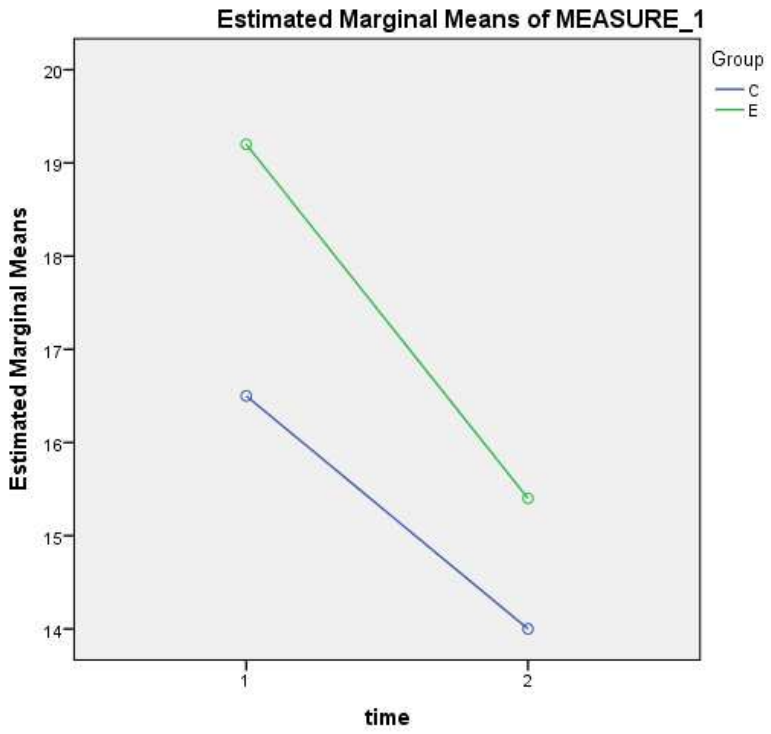

Figure 7. Estimated marginal means and interaction of PCL_Cluster E scores over time

BACE total score. A 2 X 2 repeated measures ANOVA was calculated to examine the time by group interaction and the main effect for the group (Table 11, Figure 7). There was a significant time * group interaction, $F(1, 7) = 6.796$, $p = .035$. The main effect for time was significant, $F(1, 7) = 62.236$, $p < .001$. The main effect for group was not significant $F(1, 7) = 2.553$, $p = .154$; the BACE total score variable was influenced by time * group interaction and time. Effect size and percent change were calculated to detect meaningful results. In the treatment group, Cohen's effect size was calculated as a large effect ($d = 3.51$) and percent change was calculated as a -25.33% decrease. In the control group for the same dependent variable, Cohen's effect size was calculated as a large effect ($d = 1.49$) and percent change was calculated as a -12.20% decrease (Table 4, Figure 10).

Table 11

Results of Repeated Measures Analysis of Variance for BACE_total

		Between Subjects Effects		
		df	*F*	*p*
BACE_total				
	Group	1	2.553	0.154
	Error	7		
		Within Subjects Effects		
		df	*F*	*p*
BACE_total				
	Time	1	62.236	.000**
	Time x Group	1	6.796	.035*
	Error	7		

Note. * = significance at the $p < .05$ value; ** = significance at the $p < .001$ level

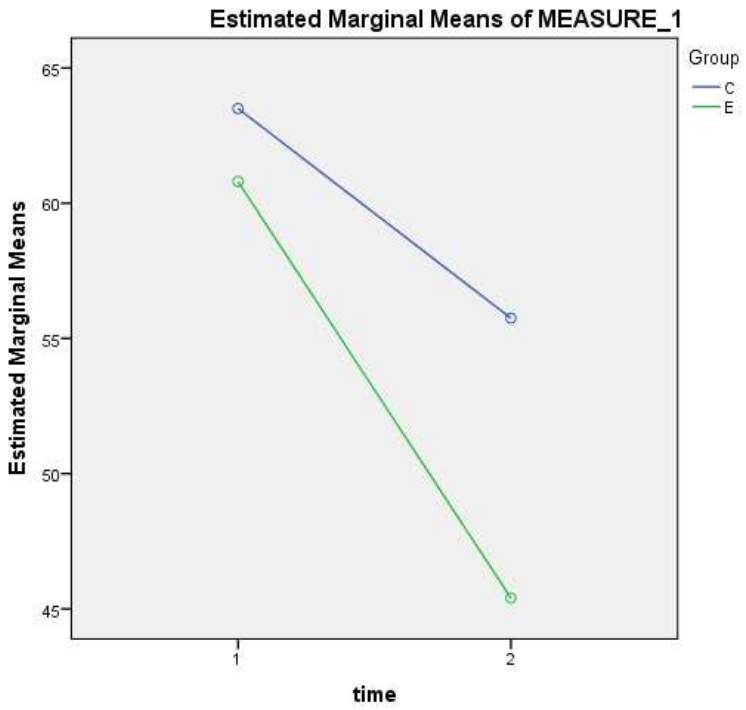

Figure 8. Estimated marginal means and interaction of BACE_total scores over time

BACE Stigma score. A 2 X 2 repeated measures ANOVA was calculated to examine the time by group interaction and the main effect for the group (Table 12, Figure 8). There was a

significant time * group interaction, $F(1, 7) = 10.306$, $p = .015$; . The main effect for time was significant, $F(1, 7) = 72.132$, $p < .001$ The main effect for group was not significant $F(1, 7) = .206$, $p = .664$; the BACE Stigma score variable was only influenced by time * group interaction and time. Effect size and percent change were calculated to detect meaningful results. In the treatment group, Cohen's effect size was calculated as a large effect ($d = 1.67$) and percent change was calculated as a -25% decrease. In the control group for the same dependent variable, Cohen's effect size was calculated as a large effect ($d = .81$) and percent change was calculated as a -11.50% decrease (Table 4, Figure 10).

Table 12

Results of Repeated Measures Analysis of Variance for BACE_stigma

		Between Subjects Effects		
		df	*F*	*p*
BACE_stigma				
	Group	1	0.206	0.664
	Error	7		
		Within Subjects Effects		
		df	*F*	*p*
BACE_stigma				
	Time	1	72.132	.000**
	Time x Group	1	10.306	.015*
	Error	7		

Note. * = significance at the p < .05 value; ** = significance at the $p < .001$ level

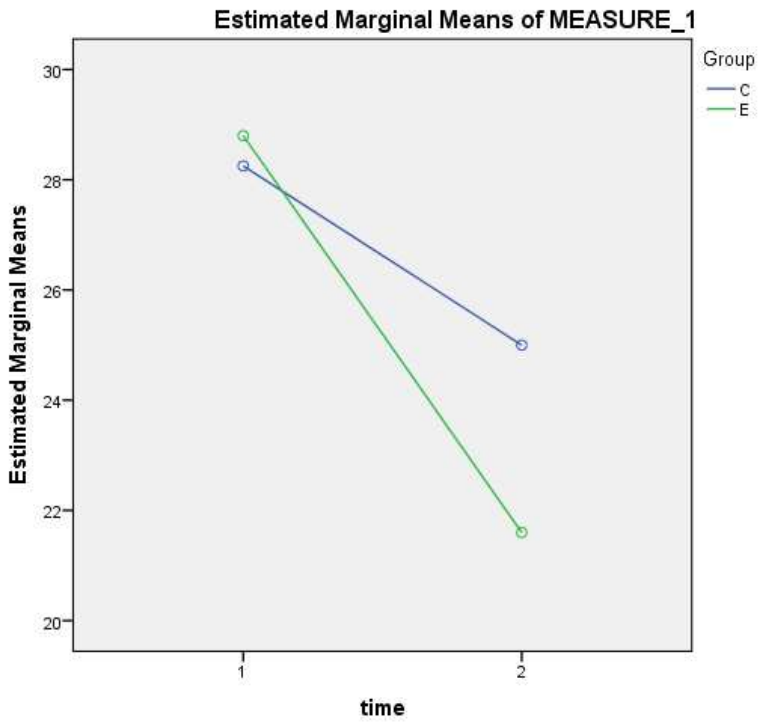

Figure 9. Estimated marginal means and interaction of BACE_stigma scores over time

Estimated VO_2max . A 2 X 2 repeated measures ANOVA was calculated to examine the time by group interaction and the main effect for the group (Table 13, Figure 9). There was not a significant time * group interaction, $F(1, 7) = .903$, $p = .373$. The main effect for time was significant, $F(1, 7) = 16.917$, $p = .004$. The main effect for group was not significant $F(1, 7) = .770$, $p = .409$; the estimated VO_2max variable was only influenced by time. Effect size and percent change were calculated to detect potentially meaningful results from non-statistically significant results. In the treatment group, Cohen's effect size was calculated as a large effect ($d = 1.11$) and percent change was calculated as a 45.17% increase. In the control group for the same dependent variable, Cohen's effect size was calculated as a large effect ($d = .59$) and percent change was calculated as a 20.33% increase (Table 4, Figure 10).

Table 13

Results of Repeated Measures Analysis of Variance for Estimated VO_2max

		Between Subjects Effects		
		df	*F*	*p*
Estimated VO_2max				
	Group	1	0.77	0.406
	Error	7		
		Within Subjects Effects		
		df	*F*	*p*
Estimated VO_2max				
	Time	1	16.917	.004*
	Time x Group	1	0.903	0.374
	Error	7		

Note. * = significance at the $p < .05$ value; ** = significance at the $p < .001$ level

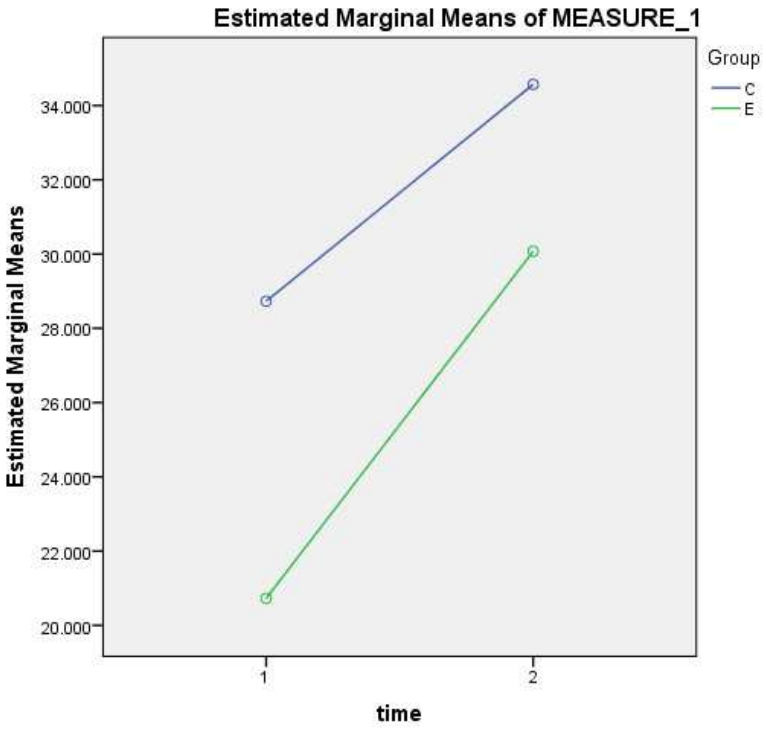

Figure 10. Estimated marginal means and interaction of estimated VO_2max scores over time

Summary

There were no significant group effects for any dependent variable. There were significant time * group interactions for the following dependent variables, BACE total score and BACE Stigma score, and there were significant time effects for the following dependent variables, PCL-5 total score, PCL-5 Cluster B, PCL-5 Cluster C, PCL-5 Cluster D, PCL-5 Cluster E, PCL-5 Cluster D, BACE total score, BACE Stigma score, and estimated VO_2max. Effect sizes and percent change were calculated to measure the magnitude of change for each dependent variable and to detect potentially meaningful results from non-statistically significant results.

Based on results, the primary researcher failed to reject the first research null hypothesis 1) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will on average not have greater improvement of symptoms of PTSD among military veterans when compared veterans who participate in a HBM only intervention; the primary researcher failed to reject the second null hypothesis, 2) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will not on average have greater improvement in cardiovascular endurance among military veterans with symptoms of PTSD when compared to veterans receiving a HBM only intervention, and the primary researcher rejected the third research null hypothesis, 3) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will not have on average a greater reduction in perceived barriers to treatment for military veterans with symptoms of PTSD when compared to veterans participating in a HBM only intervention.

CHAPTER V

DISCUSSION

Purpose/Hypotheses

The purposes of this research study were to determine if a four-week recreational physical activity intervention combined with components of the HBM could on average serve as an efficient modality to treat symptoms of PTSD among military veterans when compared to a four-week intervention based only on components of the HBM; determine if a four-week recreational physical activity intervention combined with components of the HBM can on average improve cardiovascular health among military veterans with symptoms of PTSD compared to a four-week intervention based only on components of the HBM; and to determine if a four-week recreational physical activity intervention combined with HBM could on average reduce perceived barriers to treatment compared to a four-week intervention based only on components of the HBM.

Significance

Due the prevalence of PTSD among military veterans in the United States (U.S.), it is becoming increasingly important to find alternatives to traditional treatment modalities (e.g., pharmacological and psychotherapy) (Kessler et al., 2005; Kessler & Ustun, 2008).

There is also a significant presence of comorbid issues among military veterans who have been diagnosed with PTSD, which commonly consists of conditions such as anxiety (Hoge et al., 2004), depression (Dedert et al., 2009), decreased physical activity levels (Zen et al., 2012), and poor health behaviors (Zen et al., 2012). With the known benefits of physical activity on mental health illnesses (Richardson et al., 2005), it is critical for recreational therapists to seek non-pharmacological treatment modalities, such as physical activity in the form of an educational walking group, which focuses on the six constructs from the Health Belief Model (HBM) as an education tool and motivator to engage in physical activity (Hall et al., 2015; Tsatsoulis & Fountoulakis, 2006; Whitworth & Ciccolo, 2016).

This research is significant because the prevalence of military veterans with PTSD is rising each year (Kessler et al., 2005; Kessler & Ustun, 2008). This research is also significant because it is a unique study that utilizes a theoretical foundation (HBM) in conjunction with a physical activity intervention to improve symptom severity of PTSD, cardiovascular health, and decrease barriers to accessing health care. The findings of this research will have the potential to open up an area in the literature for further exploration, in addition to making a contribution to treatments that military veterans with PTSD may receive. This is what makes the current research study important because it is a unique study that utilizes a theoretical foundation (HBM) in conjunction with a physical activity intervention to improve symptom severity of PTSD, cardiovascular health, and decrease barriers to accessing health care.

Restatement of Results

There were no significant group effects for any dependent variable. There were significant time * group interactions for the following dependent variables, BACE total score and BACE Stigma score ($p < .05$), and there were significant time effects for the following dependent variables, PCL-5 total score, PCL-5 Cluster B, PCL-5 Cluster C, PCL-5 Cluster D, PCL-5 Cluster E, PCL-5 Cluster D, BACE total score, BACE Stigma score, and estimated VO_2max ($p < .05$).

Therefore, the primary researcher failed to reject the first research null hypothesis 1) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will on average not have greater improvement of symptoms of PTSD among military veterans when compared veterans who participate in a HBM only intervention; the primary researcher failed to reject the second null hypothesis, 2) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will not on average have greater improvement in cardiovascular endurance among military veterans with symptoms of PTSD when compared to veterans receiving a HBM only intervention, and the primary researcher rejected the third research null hypothesis, 3) a four-week recreational physical activity intervention combined with components of the HBM and 150 minutes of moderate-intensity recreational physical activity per week will not have on average a greater reduction in perceived barriers to treatment for military veterans with symptoms of PTSD when compared to veterans participating in a HBM only intervention.

Effect sizes and percent change were calculated to measure the magnitude of change for each dependent variable and to detect potentially meaningful results from non-statistically significant results. Effect sizes for all dependent variables in the experimental group were all large and greater than the control group effect sizes, with the exclusion of the PCL-5 Cluster E variable. Effect sizes for the comparison group ranged from small to large (Table 4, Figure 10).

It is also notable and may provide more meaningful results to the current research study to identify the reliable and clinically significant changes of the PCL-5 total scores for the current research study. Scores range from 0-80 on the PCL-5, with a higher score indicating more severe symptoms (U.S. DVA, 2012; Weathers et al., 2013). Clinicians use the following number values to determine reliable and clinically significant changes in symptom severity of PTSD among military veterans; a 5-10 point change represents a reliable change in symptom severity of PTSD

and a 10-20 point change represents a clinically significant change in symptom severity of PTSD (U.S. DVA, 2012; Weathers et al., 2013). In order to keep participant scores private, an average of the change of PCL-5 scores were taken from the experimental group and the control group. The experimental group (n = 5) on average had a change of 11.4 points, indicative of an overall clinically significant change in symptom severity of PTSD among military veterans who engaged in the combination HBM and physical activity intervention. The control group (n = 4) on average had a change of 6.25 points, indicative of an overall reliable change in symptom severity of PTSD among military veterans who only engaged in the HBM processing group. These results are important for the current research study, because even though there were not statistically significant differences between groups, we can see there was a meaningful change of symptom severity over time for both groups, but the combination HBM and physical activity group was more effective in eliciting a positive change.

Comparison of Literature

Physical Activity and Health Belief Model Interventions. This research study is significant and beneficial to the field because it is a unique study that utilizes a theoretical foundation (HBM) in conjunction with a physical activity intervention to improve symptom severity of PTSD, cardiovascular health, and decrease barriers to accessing health care. It is believed this is the first research study designed focusing on utilizing a combination of a recreational physical activity and Health Belief Model education to decrease symptom severity among military veterans with symptoms of PTSD. The Health Belief Model (HBM) was designed to predict if an individual will adopt a health behavior (e.g., physical activity) as a preventive health measure to treat a diagnosed illness (Carpenter, 2010; Eraker et al., 1984; Jones et al., 2014). The HBM theorizes that an individual's readiness to act is based upon six constructs; perceived susceptibility (the patient believes he/she is susceptible to the illness), perceived severity (the patient believes the illness is serious), perceived benefits (the patient believes taking action will reduce susceptibility to the illness), perceived barriers (the patient

believes the positive effects of taking action outweigh the negative effects), self-efficacy (the patient is confident in their ability to take action), and cues to action (the patient is exposed to internal and external motivators) (Pescatello et al., 2014; Rosenstock et al., 1988). The current research study utilized the aforementioned six constructs of the HBM while implementing a recreational physical activity intervention to help motivate, educate, and prevent further health complications associated with PTSD (Pescatello et al., 2014; Rosenstock et al., 1988). The following strategies were utilized for addressing all six constructs in order to promote physical activity, provide education relating to a health diagnosis, and provide education on eliminating barriers to health care are as follows; provide education to participants about potential risk factors associated with a specific illness to change perceived susceptibility, discuss associated costs and behavior outcomes and potential treatment options to change perceived severity, provide education on the overall benefits of physical activity to change perception of benefits, provide education on the benefits of a low-cost physical activity, provide education on different low-cost physical activity options to change perceived barriers, identify potential internal and external motivating factors to improve cues to action, and lastly, assess the persons confidence level for different forms of physical activity and use self-confidence building techniques to increase self-efficacy (Pescatello et al., 2014). Due to the lack of literature looking specifically at implementing physical activity interventions as treatment modalities in addition to utilizing the Health Belief Model as an educational tool for military veterans with symptoms of PTSD, research studies that utilized similar populations were used for comparing and contrasting results.

Hoerster et al. (2012) reported that military veterans with a mental health diagnosis were more likely to experience physical inactivity when compared to veterans with no mental health diagnosis. De Assis and colleagues (2008) found that after a military veteran had been diagnosed with PTSD, their perceived physical activity decreased from 52% to 22%. Buckley and colleagues (2004) also found that compared with the general population, approximately 58% of military veterans seeking treatment for PTSD did not meet the national physical activity

guidelines. The current research study had consistent results with previous literature, where 77.8% (n = 7) of participants self-reported as not meeting national physical activity guidelines of 150 minutes of moderate-intensity physical activity per week (Haskell et al., 2007; Pescatello et al., 2014) and 22.2% (n = 2) self-reported as non-sedentary.

For the current research study, there were no statistically significant differences among the dependent variables, PCL-5 total score, PCL-5 cluster B, PCL-5 cluster C, PCL-5 cluster D, PCL-5 cluster E, or estimated VO_2max ($p > .05$). There were statistically significant differences among the dependent variables BACE total score and BACE stigma ($p < .05$). According to the effect size calculations and percent changes, it may be speculated that with more time for the interventional phase and with a higher number of participants, all dependent variables may be statistically significant. Penedo and Dahn (2005) conducted a literature review to determine the association between exercise, physical activity, physical health, and mental health. The literature review included a broad range of populations, ranging from adolescents to older adults (Penedo & Dahn, 2005). Results indicated that physical activity was able to improve overall health among individuals with cancer, cardiovascular disease, obesity, and sexual dysfunction (Penedo & Dahn, 2005). The study by Penedo and Dahn (2005) may help explain the why there were larger effect sizes and a greater percent change among the experimental group when compared to the control group. This may also help explain why the experimental group had statistically significant scores when compared to the control group. According to Penedo and Dahn (2005), participants who engage in regular physical activity will present with better health outcomes, including better quality of life, increased physical and mental outcomes, and increased knowledge of health care options. Similarly, results of a systematic literature review analyzing the effects of sport and physical activity on overall well-being of military veterans indicated that physical activity and sports could improve well-being, symptoms of PTSD, affect, psychological well-being, and social well-being (Caddick & Smith, 2014). Different types of physical activities utilized ranged from adaptive sports, outdoor adventure pursuits, fly-fishing, and community exercise programs

(Caddick & Smith, 2014). The physical activity intervention utilized in the current research study was a walking group.

More specifically related to military veterans with symptoms of PTSD, Babson et al. (2015) conducted a study to analyze the effects of a combination of exercise and sleep on symptom severity of PTSD among military veterans. Researchers found that aerobic exercise in the form of cycling was able to reduce symptoms of hyperarousal among veterans who had poor sleep quality, where the PTSD Checklist – Military Version was utilized to measure symptom severity (Babson et al., 2015). These results are similar to the current research study; however, it should be noted that the sample size was much larger and intervention was longer. Babson et al. (2015) had a total of 217 participants and the intervention length ranged from 60-90 days. Participants who had moderate mileage cycled (n = 20) and high mileage cycled (n = 21) saw greatest reductions in hyperarousal symptoms. It should be noted that the sample size in the current research study only had 5 participants engage in the combined recreational physical activity intervention. The high effect size calculations and large percent changes for the experimental group of the current research study, and results from Babson et al. (2015) may indicate that if the intervention length would have been longer and if the sample size was larger, there may have been statistically significant results.

Due to the length of the intervention period of the current research study being 4 weeks, this research study is comparable to the study by Ensari et al. (2015) that examined the acute effects of exercise on state anxiety. A meta-analysis of randomized controlled trials was conducted to understand the acute effects of exercise on state anxiety, which may be defined as emotional provocation during imminent threatening or dangerous circumstances (Ensari et al., 2015). It was reported that a single bout of exercise was able to improve state anxiety symptoms when compared to no exercise ($p < .05$) in their review of 36 randomized control trials (Ensari et al., 2015). Exercise intensities varied from low to high and some common exercise modes included cycle ergometer, yoga, treadmill, resistance training, rowing ergometer,

Stairmaster, and outdoor walking (Ensari et al., 2015). A similar modality was chosen for the current research study, moderate intensity walking group that was held outside twice per week for four weeks. Rosenbaum and colleagues (2015) conducted a systematic review and meta-analysis that is comparable to the current research study, which analyzed the effects of physical activity on PTSD. Results were indicative that individuals who were placed in the physical activity groups saw a greater decrease in symptoms of PTSD than those who were not placed in the physical activity groups (Rosenbaum et al., 2015). These results are similar to the results from the current research study.

A systematic review was conducted to evaluate the effectiveness of interventions based upon the theoretical framework of the HBM for improving adherence to health promoting behaviors (Jones et al., 2014). Fourteen out of 18 reviewed studies indicated interventions that utilized the HBM were able to statistically improve adherence to health promoting behaviors (Jones et al., 2014). Similar to the techniques utilized in the current research study, common techniques utilized within the interventions by Jones and colleagues (2014) to change behavior consisted of providing educational information about health concerns to participants, utilizing a prompt such as a written or verbal script (commonly used together), and facilitating self-reflection (Jones et al., 2014). The current research study facilitated a recreational physical activity group that facilitated processing questions that provoked critical thinking in regards to the six constructs of the HBM and improve health behaviors among military veterans experiencing symptoms of PTSD.

Specifically comparing the current research study to previous literature that utilized the HBM to increase physical activity and educate individuals about a health diagnosis, Speer and colleagues (2008) conducted a study utilizing a community-based educational and physical activity program to improve diabetes self-management and A1c among older adults (n = 141) with the diagnosis of diabetes. Similarly, to the current research study, authors incorporated principles from the HBM throughout a 4-month intervention (Speer et al., 2008). The researcher's

from the Speer and colleagues (2008) study provided educational information about resources and corrected misinformation to improve participants' perceived barriers (Speer et al., 2008). The researchers to the current research study utilized similar techniques by providing educational information, correction of misinformation through discussion and processing questions, and recommendations and resources to overcome individual perceived barriers (Appendix M). To improve cues to action, researchers from the Speer and colleagues (2008) study provided recommendations on how to self-manage diabetes (Speer et al., 2008). The researchers to the current research study utilized similar techniques by providing education and recommendations on how to manage and decrease symptom severity of PTSD (Appendix M). Researchers from the Speer and colleagues (2008) study presented and reinforced different ways to manage diabetes to improve self-efficacy (Speer et al., 2008). The researchers to the current research study used different self-confidence building techniques to increase self-efficacy (Appendix M). It should be noted the difference in sample size and intervention length between the current research study and the study by Speer and colleagues (2008). The large effect sizes and percent changes within the current research study may indicate that if the sample size would have been larger and if the intervention length would have been longer there would have been statistically significant results.

Mo et al. (2016) conducted a study that utilized individuals with mental illness (n = 443) to determine the various health benefits associated with physical activity utilizing the HBM. Authors concluded that self-efficacy was associated with higher physical activity and perception of barriers was associated with a higher level of physical inactivity (Mo et al., 2016). They called for future research to utilize physical activity interventions based on the HBM, and to focus on the constructs of improving self-efficacy and perceived barriers (Mo et al., 2016). Additionally, Castonguay et al. (2016) examined interviews within the HBM among individuals with depression who sought help. Based on the interviews, practical implications for applying interventions based upon the HBM were developed. Implications included focus on reducing uncertainty by targeting the social support system and the individual seeking treatment,

promoting external interpersonal cues to action, creating a sense of hope and encouragement, and educating the individual that in order to manage their condition treatment is necessary (Castonguay et al., 2016). Mo and collegaues (2016), determined that in order to improve adherence to physical activity among individuals with mental illness all six constructs within the HBM should be utilized. However, contrary to previous research by Jones and colleagues (2008), who determined that self-efficacy, perceived barriers, and cues to action were most effective in promoting behavior change, Mo and colleagues (2016) noted that self-efficacy and perceived barriers were the least impactful for changing behavior. The current research study did not examine which constructs of the HBM were most effective; however, all constructs were utilized during the processing and educational portion of the intervention. During week one of the current research study, perceived susceptibility, self-efficacy, and cues to action were addressed; during week two perceived severity, cues to action, and self-efficacy were addressed; during week three perceived benefits, cues to action, and self-efficacy were addressed; and during the fourth and final week perceived barriers, cues to action, and self-efficacy were addressed.

After comparing and contrasting previous literature and the current research study, it appears that utilizing all six constructs of the HBM within a recreational physical activity intervention may be able to improve military veterans' perceptions of the symptoms of PTSD they experience in addition to gaining knowledge about perceived barriers to seeking health care (Castauguay et al., 2016; Mo et al., 2016; Pescatello et al., 2014; Rosenstock et al., 1988; Speer et al., 2008)

Barriers to Accessing Health Care. Due to the known barriers to access health care among military veterans with symptoms of PTSD, it is imperative for health care professionals to find alternative treatments to help reduce the various barriers associated with seeking help (Ensari et al., 20015; Stults-Kolehmainen & Sinha, 2014). The current research study incorporated an aspect of perceived barriers education, taken from one of the six constructs of the HBM. According to Stecker and colleagues (2013), there are four major perceived barriers to military

veterans from Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) seeking treatment for PTSD. Out of 143 military veterans 40% did not seek treatment due to fear of being prescribed psychotropic medication, 35% did not seek treatment due to lack of emotional readiness, 16% did not seek treatment due to concern with negative stigma, and 8% did not seek treatment due to logistical issues (e.g., not having enough time, too far of a distance to treatment facility) (Stecker et al., 2013). Hoge and colleagues (2004) conducted a similar but larger study (n = 703) among military veterans of OEF/OIF. Researchers determined that of the military veterans diagnosed with a mental disorder (e.g., PTSD), only 23-40% sought treatment. Common perceived barriers included the following, not trusting mental health professionals (38%), not knowing where to go for help (22%), lack of transportation (18%), difficulty scheduling an appointment (45%), could not take time off of work (55%), too high of cost of care (41%), it would be embarrassing (41%), it would harm their career (50%), member of a soldier's unit may have less confidence in them (59%), leadership would treat them differently (63%), it is a sign of weakness (65%), and mental health care does not work (25%) (Hoge et al., 2004). Similarly, the current research study found that participants did feel there were significant barriers to seeking health care, such as not knowing where to go to help, thinking it would harm their career, and stigma related associations with seeking help. It should be noted that the previous literature notes percentages and identifies specific barriers that impact health care seeking behavior; however, the current research study took those identified barriers and looked at pre and post assessments to determine an effective intervention to eliminate those barriers, which provides an abundance of knowledge to the literature. The current study found that there were significant differences between experimental and control group for barriers to access health care survey scores in both the overall total score ($p = .035$) and for the isolated stigma score ($p < .001$).

It should be noted that both the experimental and control group received a standardized educational processing group based on the six constructs of the HBM (Appendix M). What could

have caused the more effective change in the experimental group is the concept of 'similar others' and 'green exercise' (Barton & Pretty, 2010; Frable, Platt, & Hoey, 1998; Kranke et al., 2017; Poulsen, Stigsdotter, Djernis & Sidenius, 2016). Since the experimental group received both the HBM leisure education processing group in addition to the outdoor walking group, it may be speculated that this impacted their perceived barriers to accessing healthcare. The concept that nature has it's own set of healing properties has been long rese arched (Poulsen et al., 2016). Specifically, green exercise is a newer concept that can be defined as engaging in physical activity while simultaneously in the presence of nature (Barton & Pretty, 2010). Barton and Pretty (2010) conducted a study that synthesized pre-existing research to measure the impact exercise in natural environments has on mental health status. The researchers found that out of all reviewed studies (n = 10), settings varied from urban parks, to farmlands and forests, to wilderness, and waterside, and consisted of different activities such as biking, walking, gardening, and other recreational activities (Barton & Pretty, 2010). Across all studies reviewed, self-esteem and overall mood status significantly improved after being outside and the highest change happened after at minimum of five minutes were spent outside. Results also indicated that men experienced greater changes in mood and self-esteem when compared to women, and those individuals with mental health illnesses experience higher increases in self-esteem and mood than those individuals who were not mentally ill (Barton & Pretty, 2010). This concept may impact why participants in the experimental group of the current research study experienced a statistically significant different in perceived barriers to access health care than the control group.

A secondary concept of 'similar others' may have impacted the results of the current research study, which can be defined as individuals who are similar to each other have greater influence on each other's outcomes (Frable et al., 1998). In a highly cited article by Frable and colleagues (1998), researchers found that among individuals with low self-esteem, poor finances, and mental health issues, only the presence of similar others improved their self-esteem, mood, and stigma (Frable et al., 1998). Kranke and colleagues (2017) also conducted a study to explore

peer-based supportive environment for veterans with PTSD to reduce mental health stigma. Results indicated that military veterans might be able to use peer-led though restructuring groups to eliminate stigma perceptions associated with mental health and PTSD (Kranke et al., 2017). These research studies may help explain results from the barriers to access health care surveys, indicated that since individuals in the experimental group were with similar others for a larger amount of time and engaged in more thoughtful discussion throughout the walking group, this could explain why the experimental group saw significant improvements in perceived barriers to accessing health care pre and post intervention.

After an extensive review of the literature and results to the current research study, it may be concluded that a combination HBM and recreational physical activity intervention may be an effective alternative means to treat symptom severity of PTSD and perceived barriers to access health care among military veterans experimenting symptoms of PTSD. Below the limitations, strengths, and practical applications will be discussed.

Limitations

The main limitation to this study was the small sample size (n = 9). The sample size can have an impact on confidence levels, margins or error, power, and effect size, which ultimately impact the reliability and validity of a research study. The sample size is a direct reflection of the target population and when the sample size is small, it may not be a good representation of the target population and make it difficult to make generalizations to a larger population (Berg & Latin, 2008; Kirk, 2013; Vincent & Weir, 2012). The small sample size could be attributed to recruitment being confined to one community center for individuals who are military veterans and barriers to health care seeking behaviors, such as not trusting mental health professionals, lack of transportation, lack of time, negative stigma, and concern for career (Hoge et al., 2004; Shiner, 2011; Stecker et al., 2013). Additionally, recruitment being isolated to the veteran community center will limit generalizability of this research study (Berg & Latin, 2008; Kirk, 2013; Vincent & Weir, 2012). If there would have been a longer time frame for recruitment, the

sample size may have been greater. With already a small sample size, the dropout of three participants midway through the study due to one participant not meeting inclusion criteria, one dropped out in the second week of the intervention due to miscellaneous reasons, and the third participant dropped out after pre-testing data collection for miscellaneous reasons. The broad age range of participants in both the treatment and control group may have impacted the variability of this study, which may also be a limitation for this study. An additional limitation to this study could be the length of the intervention period because there may not have been enough time to see the change of variables.

Not controlling for walking in the outdoor environment was also a limitation to this study. Research shows that being in nature has its own set of healing properties and can improve self-esteem and overall mood status after spending a minimum of five minutes outside (Barton & Pretty, 2010; Poulsen et al., 2016). It was also determined that men experience greater changes in mood and self-esteem after being in nature compared to females (Barton & Pretty, 2010), a limitation to the current research study was not controlling for the differences in males and females. Not controlling for the impact of a cohort, or being with 'similar others' was a limitation to the current research study. Research indicates that just being in the presence of similar others can improve an individual's self-esteem, mood, and stigma (Frable et al., 1998) and that peer-based supportive environments have been shown to reduce mental health stigma among military veterans with PTSD (Kranke et al., 2017). It may also be noted that a limitation to this study is that the control group (HBM only) did have knowledge that the experimental group (HBM and physical activity) was receiving an additional 30 minutes of intervention time that consisted of an outdoor walking group.

Another limitation to the current research study that must be noted includes not using standardized laboratory grade equipment to measure estimatedVO_2max. There is much variance in utilizing field testing for research purposes. It may also be speculated that adding a familiarization period could have helped eliminate any test learning effects that could have

occurred between pre and post testing of this research study, which may have posed as a limitation.

Strengths

An important strength to the current research study was that it is a unique study that utilizes a theoretical foundation (HBM) in conjunction with a physical activity intervention to improve symptom severity of PTSD, cardiovascular health, and decrease barriers to accessing health care for military veterans. The current research study focused on using recreational physical activity and a HBM leisure education component as a treatment modality to improve symptom severity of PTSD among military veterans. Another anecdotal strength to the current research study was the amount of enjoyment that the participants had during the experimental intervention, participants appeared to enjoy walking with each other and sharing different experiences post-deployment. This anecdotal information is important after considering the barriers to access health care, which primarily consist of military veterans being scared to reach out due to stigma related issues and concerns that they would be viewed as less than due to their mental illness (Hoge et al., 2004; Stecker et al., 2013). This research study provided many ways to offset barriers to access health care, such as providing a free program to treat symptoms of PTSD in a community setting, providing non-psychotherapy interventions, providing non-pharmacological interventions, and by providing cost-effective alternative to traditional treatments.

Future Directions

Based on the findings of this research study and previous literature, the impact of physical activity on symptom severity of PTSD among military veterans should be continued to research (Carpenter, 2010; Eraker et al., 1984; Jones et al., 2014; Whitworth & Ciccolo, 2016). Future research should include increasing the sample size of the intervention and control groups to improve power of the research study. Future research should control for variables such as gender, similar others, and setting of physical activity (e.g., green exercise) (Barton & Pretty,

2010; Poulsen et al., 2016). It would be beneficial to include a true control group that does not receive any activity or intervention. It also would be beneficial for future research to add a third data collection period in hopes to eliminate any learning curves from the cardiorespiratory fitness testing or on the surveys. Future studies may also add in variables that measure more than just PTSD, such as anxiety levels, depression, and quality life (Bauman, 2004; Lai et al., 2014; Mente et al., 2009; Penedo & Dahn, 2005; Whitworth & Ciccolo, 2016). Lastly, it would be beneficial for researchers to use a laboratory grade cardiorespiratory fitness exam such as measuring gas exchange to get a measure of estimated VO_2max (Pescatello et al., 2014).

Practical Implications

The combination recreational physical activity intervention with a HBM processing component appeared to be an enjoyable and effective way to increase knowledge of barriers to access health care and the importance of physical activity for managing symptoms of PTSD. Based on previous literature and meaningful effect size calculations of the current research study, it may be determined this is one possible method for improving and/or managing symptom severity of PTSD among military veterans. This is important for recreational therapists as it presents a viable, effective, efficient, and cost-effective method of treating military veterans who may be experiencing symptoms of PTSD.

This research is also extremely important for recreational therapists because it provides an alternative to traditional treatments, which is where the recreational therapist can use this treatment modality. This type of intervention can be easily implemented in an inpatient, outpatient, or community b setting because the only necessary materials needed are a space to perform the physical activity and a space to engage in group discussion. It should also be addressed that based on the effect size calculations and percent change within the current research study, there were greater improvements in the experimental group than the comparison group collectively; however, there were still moderate to large effects for several dependent variables in

the comparison group. This may be an indicator that both the combination physical activity and HBM group and the HBM only group can create a positive increase in outcomes.

Conclusions

The rates of PTSD among military veterans are much greater when compared to military veterans without mental health issues (Bourn et al., 2016) and the general population (Kessler & Ustun, 2008), and are higher in the U.S. than any other country (Kessler et al., 2005; Kessler & Ustun, 2008). Due to the known benefits of physical activity on mental and physical health (Bauman, 2004; Lai et al., 2014; Mente et al.,, 2009; Penedo & Dahn, 2005), it was imperative to study the impact of an alternative treatment method for treating symptoms of PTSD, such as a combination HBM and recreational physical activity intervention (Castonguay et al., 2016; Fitzpatrick et al., 2008; Mirotznik et al., 1995; Mo et al., 2016; Speer et al., 2008). After an extensive review of the literature and analyzing the results of the current research study, it may be speculated that a combination HBM and recreational physical activity may serve as an invaluable addition to a non-pharmacological treatment plan (Tsatsouli & Fountoulakis, 2006). Considering the major barriers associated with seeking treatment for military veterans, it may also be speculated that a combination HBM and recreational physical activity intervention may serve as an invaluable addition to a non-pharmacological treatment plan (Hall et al., 2015; Whitworth & Ciccolo, 2016). Understanding the blunted effects of traditional psychotherapy treatments among military veterans with symptoms of PTSD and a growing understanding of the impact physical activity can have on mental health, authors to the current research study recommend continuing to research effective alternatives to traditional psychotherapy treatments for military veterans experiencing symptoms of PTSD (Carpenter, 2010; Eraker et al., 1984; Jones et al., 2014; Whitworth & Ciccolo, 2016).

CHAPTER VI

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APPENDICES

Appendix A

Letter of Support from Site

Michael Horton

September 11, 2017 at 8:59 AM

To: Michelle Miller

Re: Doctoral Recreational Therapy Candidate

MH

Ms. Miller,

You have my approval to recruit veterans through the Coffee Bunker, Tulsa, Oklahoma for your dissertation research related to treatment of ptsd symptoms through a walking treatment program.

Regards,

Michael Horton, EdD, USAF
Executive Director
The Coffee Bunker

Appendix B

Institutional Review Board Approval of Application

Oklahoma State University Institutional Review Board

Date:	Thursday, May 25, 2017
IRB Application No	ED1751
Proposal Title:	Impact of Recreational Physical Activity on Symptom Severity of PTSD among Student Military Veterans
Reviewed and Processed as:	Expedited

Status Recommended by Reviewer(s): Approved Protocol Expires: 5/24/2018

Principal Investigator(s):

Michelle Miller
Stillwater, OK 74078

Melissa Zahl
180 CRC
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☐ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1.Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval. Protocol modifications requiring approval may include changes to the title, PI advisor, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2.Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3.Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of the research; and
4.Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Dawnett Watkins 219 Scott Hall (phone: 405-744-5700, dawnett.watkins@okstate.edu).

Sincerely,

Hugh Crethar, Chair
Institutional Review Board

Oklahoma State University Institutional Review Board

Date:	Tuesday, September 19, 2017	**Protocol Expires: 5/24/2018**
IRB Application No:	ED1751	
Proposal Title:	Impact of Recreational Physical Activity on Symptom Severity of PTSD among Military Veterans	
Reviewed and Processed as:	Expedited **Modification**	

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s):

Michelle Miller
Stillwater, OK 74078

Melissa Zahl
180 CRC
Stillwater, OK 74078

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

☐ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

Change project title from "Impact of Recreational Physical Activity on Symptom Severity of PTSD among Student Military Veterans" to "Impact of Recreational Physical Activity on Symptom Severity of PTSD among Military Vetrans", 2) include all veterans, 3) include the Coffee Bunker in Tulsa, OK as a research site, 4) change the physical activity portion from participation in a flag football league to a walking group, and 5) update consent and recruitment materials.

Signature :

Hugh Crethar, Chair, Institutional Review Board

Tuesday, September 19, 2017
Date

Appendix C

Informed Consent

INFORMED CONSENT FORM

PROJECT TITLE: Impact of Recreational Physical Activity on Symptom Severity of PTSD among Military Veterans

INVESTIGATORS:

Primary Investigator:
Michelle M. Miller, M.S., EP-C
Oklahoma State University

Co-Primary Investigator
Melissa Zahl, Ph.D., CTRS/L
Oklahoma State University

PURPOSE:

The primary purpose of this research study is to determine if the impact of recreational physical activity on symptom severity of PTSD among military veterans. The secondary purposes of this study are to determine if a four week physical activity intervention can serve as an efficient modality to treat symptom severity of PTSD; determine if a four week physical activity intervention can improve cardiovascular fitness among military veterans with PTSD; and to determine if a four week physical activity intervention can reduce barriers to treatment, as perceived by military veterans with PTSD.

PROCEDURE

Military veterans have experienced symptoms from PTSD and are 18 years of age or older will be recruited for this study. Before participation in this study the primary researcher will need to receive a signed informed consent by the participant. Once the informed consent is received the prescreening will begin. To ensure safety and readiness to participate in the physical activity program, prescreening will require participants to fill out a general demographic questionnaire and the Physical Activity Participation Questionnaire (PAR-Q), which is a questionnaire utilized to determine an individual's readiness to participate in physical activity.

Participants will then be randomly assigned to a combination physical activity and processing group or a strictly processing focus group. Baseline assessments (week 1) will include the demographic questionnaire, a questionnaire designed to measure severity of PTSD symptoms (PCL-5), a field test to measure cardiovascular fitness (Cooper 12-minute walk/run test), and a questionnaire designed to detect barriers to health seeking behavior (BACE). Post assessments (week 6) will include the PCL-5, Cooper 12-minute walk/run test, and the BACE.

The intervention will consist of a four-week recreational physical activity regimen. The physical activity intervention will consist of the participants attending a walking group at the Coffee Bunker. The participants in the experimental group will meet twice per week for four weeks to participate in the walking group and engage in discussion based upon the processing questions of the Health Belief Model's six constructs regarding symptom severity of PTSD. The sessions will last approximately 60 minutes each. The participants in the group processing only will only participate in a focus group to discuss their symptoms of PTSD and leisure education two times per week for four weeks, for approximately 60 minutes per focus group.

RISKS OF PARTICIPATION:

Risks associated with participation in this research study include muscle soreness and minimal emotional distress due to discussion of symptoms of PTSD.

BENEFITS OF PARTICIPATION:

Potential benefits include experiencing decreased symptom severity of PTSD and improved cardiovascular fitness.

CONFIDENTIALITY:

The records of this study will be kept private. Any written results will discuss group findings and will not include information that will identify you. Research records will be stored on a password protected computer in a locked office and only researchers and individuals responsible for research oversight will have access to the records. Data will be kept for three years and then destroyed after the study has been completed.

CONTACTS:

You may contact any of the researchers at the following addresses and phone numbers, should you desire to discuss your participation in the study and/or request information about the results of the study:

IRB Office
Approved: 09/19/17
Expires: 05/24/18
IRB#: ED-17-51

Michelle Miller, M.S., EP-C
School of Kinesiology, Applied Health and Recreation
Oklahoma State University, Stillwater, OK, 74078,
Phone: 254-405-1040
Email: michelle.miller10@okstate.edu

Melissa Zahl, Ph.D., CTRS/L
School of Kinesiology, Applied Health and Recreation
Oklahoma State University, Stillwater, OK, 74078
Phone: 405-744-3209
Email: melissa.zahl@okstate.edu

If you have questions about your rights as a research volunteer, you may contact the IRB Office at 223 Scott Hall, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu

If at any time during this research study you experience any unusual or abnormal physical or emotional distress please contact either the Oklahoma State University Health Service Center or the Oklahoma State University Student Counseling Center for help. Below you will find the contact information for both facilities.

Oklahoma State University
Student Counseling Center
320 Student Union
Phone: 405-744-5472

Oklahoma State University
Health Service Center
1202 West Farm Road
Phone: 405-744-7665

PARTICIPANT RIGHTS:
I understand that my participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time, without penalty.

CONSENT DOCUMENTATION:
I have been fully informed about the procedures listed here. I am aware of what I will be asked to do and of the benefits of my participation. I also understand the following statements:

I affirm that I am 18 years of age or older. I have read and fully understand this consent form. I sign it freely and voluntarily. A copy of this form will be given to me. I hereby give permission for my participation in this study.

_____ _____
Signature of Participant Date

I certify that I have personally explained this document before requesting that the participant sign it.

_____ _____
Signature of Researcher Date

Appendix D

Demographic Questionnaire

Demographic Questionnaire

DIRECTIONS: Please answer each question as accurately as possible by circling your answer or filling in the space provided.

1. What is your age? _____
2. What is your ethnic background? _____
3. What is your gender? _____
4. What is your marital status? _____
5. Do you have kids? _____
    a. If yes, how many? _____
6. Please circle which race you identify as: White, African American, American Indian, Asian, Hispanic American, Middle Eastern American
7. Which branch of the military did you serve in? _____
8. How long were you in the military? _____
9. How many deployments did you have? _____
    a. How many months was each deployment? _____
10. What was your position while active in the military? _____
11. What is your current employment status? _____
12. What was the highest level of education you completed BEFORE the military? _____
13. What was the highest level of education you completed AFTER the military? _____
14. Are you a full time student at Oklahoma State University? _____
    a. If yes, how many hours are you enrolled in? _____
    b. If yes, are you an undergraduate or graduate student? _____
15. What is your major? _____
16. Do you consider yourself to be physically active? Yes or NO
17. How many days per week are you physically active? _____
18. What is the duration of time you are engaged in physical activity per day (e.g., 15 minutes, 30 minutes, 45 minutes, etc.)? _____
19. Have you been consistently active for the past 3 months, engaging in at least 150 minutes of moderate-intensity physical activity per week? Yes or No
20. What is the intensity of your physical activity (please circle the intensity which you engage in the most frequently)? Mild (little to no perspiration with no difficulty carrying on a conversation), Moderate (moderate perspiration with difficulty carrying on a conversation), or Vigorous (significant perspiration and not being able to carry on a conversation)
21. Please describe all types of physical activity you participate in (e.g., recreational basketball league, weight lifting, running, etc.): _____

Appendix E

Barriers to Access Care Evaluation (BACE) Questionnaire

Barriers to Access to Care Evaluation — BACE-3

Instructions:
Below you can see a list of things which can stop, delay or discourage people from getting professional care for a mental health problem, or continuing to get help.

By professional care, we mean care from staff such as a GP (family doctor), member of a community mental health team (e.g. care coordinator, mental health nurse or mental health social worker), psychiatrist, counsellor, psychologist or psychotherapist.

Have any of these issues ever stopped, delayed or discouraged you from getting, or continuing with, professional care for a mental health problem?

Please circle one number on each row to indicate the answer that best suits you. For 'not applicable' please cross the 'not applicable' box.		This has stopped, delayed or discouraged me:			
		not at all	a little	quite a lot	a lot
1	Being unsure where to go to get professional care.	0	1	2	3
2	Wanting to solve the problem on my own.	0	1	2	3
3	Concern that I might be seen as weak for having a mental health problem.	0	1	2	3
4	Fear of being put in hospital against my will.	0	1	2	3
5	Concern that it might harm my chances when applying for jobs. ☐ not applicable	0	1	2	3
6	Problems with transport or travelling to appointments.	0	1	2	3
7	Thinking the problem would get better by itself.	0	1	2	3
8	Concern about what my family might think, say, do or feel.	0	1	2	3
9	Feeling embarrassed or ashamed.	0	1	2	3
10	Preferring to get alternative forms of care (e.g. traditional/religious healing or alternative/complementary therapies).	0	1	2	3
11	Not being able to afford the financial costs involved.	0	1	2	3
12	Concern that I might be seen as 'crazy'.	0	1	2	3
13	Thinking that professional care probably would not help.	0	1	2	3
14	Concern that I might be seen as a bad parent. ☐ not applicable	0	1	2	3

Barriers to Care Evaluation (BACE-3) scale © 2011. Health Service and Population Research Department, Institute of Psychiatry, King's College London.
Contact: Dr Sarah Clement, sarah.clement@kcl.ac.uk, Professor Graham Thornicroft, graham.thornicroft@kcl.ac.uk
Clement S, Brohan E, Jeffery D, Henderson C, Hatch SL, Thornicroft G. Development and psychometric properties the Barriers to Access to Care Evaluation scale (BACE) related to people with mental ill health. BMC Psychiatry, 2012 12:36.

Barriers to Access to Care Evaluation BACE-3 page 2

Please circle one number on each row to indicate the answer that best suits you. For 'not applicable' please cross the 'not applicable' box.	This has stopped, delayed or discouraged me: not at all	a little	quite a lot	a lot
15 Professionals from my own ethnic or cultural group not being available.	0	1	2	3
16 Being too unwell to ask for help.	0	1	2	3
17 Concern that people I know might find out.	0	1	2	3
18 Dislike of talking about my feelings, emotions or thoughts.	0	1	2	3
19 Concern that people might not take me seriously if they found out I was having professional care.	0	1	2	3
20 Concerns about the treatments available (e.g. medication side effects).	0	1	2	3
21 Not wanting a mental health problem to be on my medical records.	0	1	2	3
22 Having had previous bad experiences with professional care for mental health.	0	1	2	3
23 Preferring to get help from family or friends.	0	1	2	3
24 Concern that my children may be taken into care or that I may lose access or custody without my agreement. ☐ not applicable	0	1	2	3
25 Thinking I did not have a problem.	0	1	2	3
26 Concern about what my friends might think, say or do.	0	1	2	3
27 Difficulty taking time off work.	0	1	2	3
28 Concern about what people at work might think, say or do. ☐ not applicable	0	1	2	3
29 Having problems with childcare while I receive professional care. ☐ not applicable	0	1	2	3
30 Having no one who could help me get professional care.	0	1	2	3

Barriers to Care Evaluation (BACE-3) scale © 2011. Health Service and Population Research Department, Institute of Psychiatry, King's College London.
Contact: Dr Sarah Clement, sarah.clement@kcl.ac.uk, Professor Graham Thornicroft, graham.thornicroft@kcl.ac.uk
Clement S, Brohan E, Jeffery D, Henderson C, Hatch SL, Thornicroft G. Development and psychometric properties the Barriers to Access to Care Evaluation scale (BACE) related to people with mental ill health. BMC Psychiatry, 2012 12:36.

Appendix F

Borg Rate of Perceived Exertion (BRPE)

	BORG SCALE Rating of Perceived Exertion	
	6	
	7	**Very very light**
	8	
	9	**Very light**
	10	
Moderate effort	11	**Fairly light**
	12	
	13	**Somewhat hard**
	14	
	15	**Hard**
	16	
	17	**Vary hard**
	18	
	19	**Very very hard**
	20	

Appendix G

Physical Activity Readiness Questionnaire – PAR-Q

Physical Activity Readiness Questionnaire - PAR-Q (revised 2002)

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO		
☐	☐	1.	**Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?**
☐	☐	2.	**Do you feel pain in your chest when you do physical activity?**
☐	☐	3.	**In the past month, have you had chest pain when you were not doing physical activity?**
☐	☐	4.	**Do you lose your balance because of dizziness or do you ever lose consciousness?**
☐	☐	5.	**Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?**
☐	☐	6.	**Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?**
☐	☐	7.	**Do you know of any other reason why you should not do physical activity?**

If you answered YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or
- if you are or may be pregnant – talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____ DATE _____

SIGNATURE OF PARENT or GUARDIAN (for participants under the age of majority) _____ WITNESS _____

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

CSEP | SCPE

© Canadian Society for Exercise Physiology www.csep.ca/forms

Appendix H

PTSD Checklist for Diagnostic and Statistical Manual-5 (PCL-5)

PCL-5

Instructions: This questionnaire asks about problems you may have had after a very stressful experience involving *actual or threatened death, serious injury, or sexual violence.* It could be something that happened to you directly, something you witnessed, or something you learned happened to a close family member or close friend. Some examples are a *serious accident; fire; disaster such as a hurricane, tornado, or earthquake; physical or sexual attack or abuse; war; homicide; or suicide.*

First, please answer a few questions about your *worst event*, which for this questionnaire means the event that currently bothers you the most. This could be one of the examples above or some other very stressful experience. Also, it could be a single event (for example, a car crash) or multiple similar events (for example, multiple stressful events in a war-zone or repeated sexual abuse).

Briefly identify the worst event (if you feel comfortable doing so): _____

How long ago did it happen? _____ *(please estimate if you are not sure)*

Did it involve actual or threatened death, serious injury, or sexual violence?

_____Yes

_____No

How did you experience it?

_____ It happened to me directly

_____ I witnessed it

_____ I learned about it happening to a close family member or close friend

_____ I was repeatedly exposed to details about it as part of my job (for example, paramedic, police, military, or other first responder)

_____ Other, please describe _____

If the event involved the death of a close family member or close friend, was it due to some kind of accident or violence, or was it due to natural causes?

_____Accident or violence

_____Natural causes

_____Not applicable (the event did not involve the death of a close family member or close friend)

Second, keeping this worst event in mind, read each of the problems on the next page and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.

In the past month, how much were you bothered by:	*Not at all*	*A little bit*	*Moderately*	*Quite a bit*	*Extremely*
1. Repeated, disturbing, and unwanted memories of the stressful experience?	0	1	2	3	4
2. Repeated, disturbing dreams of the stressful experience?	0	1	2	3	4
3. Suddenly feeling or acting as if the stressful experience were actually happening again *(as if you were actually back there reliving it)*?	0	1	2	3	4
4. Feeling very upset when something reminded you of the stressful experience?	0	1	2	3	4
5. Having strong physical reactions when something reminded you of the stressful experience *(for example, heart pounding, trouble breathing, sweating)*?	0	1	2	3	4
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	0	1	2	3	4
7. Avoiding external reminders of the stressful experience *(for example, people, places, conversations, activities, objects, or situations)*?	0	1	2	3	4
8. Trouble remembering important parts of the stressful experience?	0	1	2	3	4
9. Having strong negative beliefs about yourself, other people, or the world *(for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)*?	0	1	2	3	4
10. Blaming yourself or someone else for the stressful experience or what happened after it?	0	1	2	3	4
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	0	1	2	3	4
12. Loss of interest in activities that you used to enjoy?	0	1	2	3	4
13. Feeling distant or cut off from other people?	0	1	2	3	4
14. Trouble experiencing positive feelings *(for example, being unable to feel happiness or have loving feelings for people close to you)*?	0	1	2	3	4
15. Irritable behavior, angry outbursts, or acting aggressively?	0	1	2	3	4
16. Taking too many risks or doing things that could cause you harm?	0	1	2	3	4
17. Being "superalert" or watchful or on guard?	0	1	2	3	4
18. Feeling jumpy or easily startled?	0	1	2	3	4
19. Having difficulty concentrating?	0	1	2	3	4
20. Trouble falling or staying asleep?	0	1	2	3	4

PCL-5 (8/14/2013) Weathers, Litz, Keane, Palmieri, Marx, & Schnurr -- National Center for PTSD

Appendix I

Written Recruitment Letter

Dear military veteran,

My name is Michelle Miller and I am a doctoral student in Recreational Therapy at Oklahoma State University. Michael Horton, the executive director of the Coffee Bunker has given me permission to recruit participants for my dissertation research study.

I am conducting a research study for military veterans 18 years of age or older who may be experiencing symptoms of PTSD. The purpose of my study is to determine if implementing a physical activity regimen or a processing group can reduce severity of symptoms of PTSD. The physical activity intervention will consist of participating in a walking group two times per week for 60-minute session each. Participants will be randomly divided into two groups.

Participation in this study will be completely voluntary. You may choose to drop out of this study at any time during the intervention with no penalties. This project has been approved by the Institutional Review Board of Human Research participants at Oklahoma State University.

If you are interested in participating in this research study please contact me at michelle.miller10@okstate.edu; 254-405-1040.

Thank you for your time and I look forward to speaking with you further about this opportunity.

Sincerely,
Michelle Miller

Appendix J

Verbal Recruitment Script

I appreciate your time and would like to introduce my proposed research study and speak with you about potentially participating in my research study.

My name is Michelle Miller and I am a doctoral student in Recreational Therapy at Oklahoma State University. Michael Horton, the executive director of the Coffee Bunker has given me permission to recruit participants for my dissertation research study.

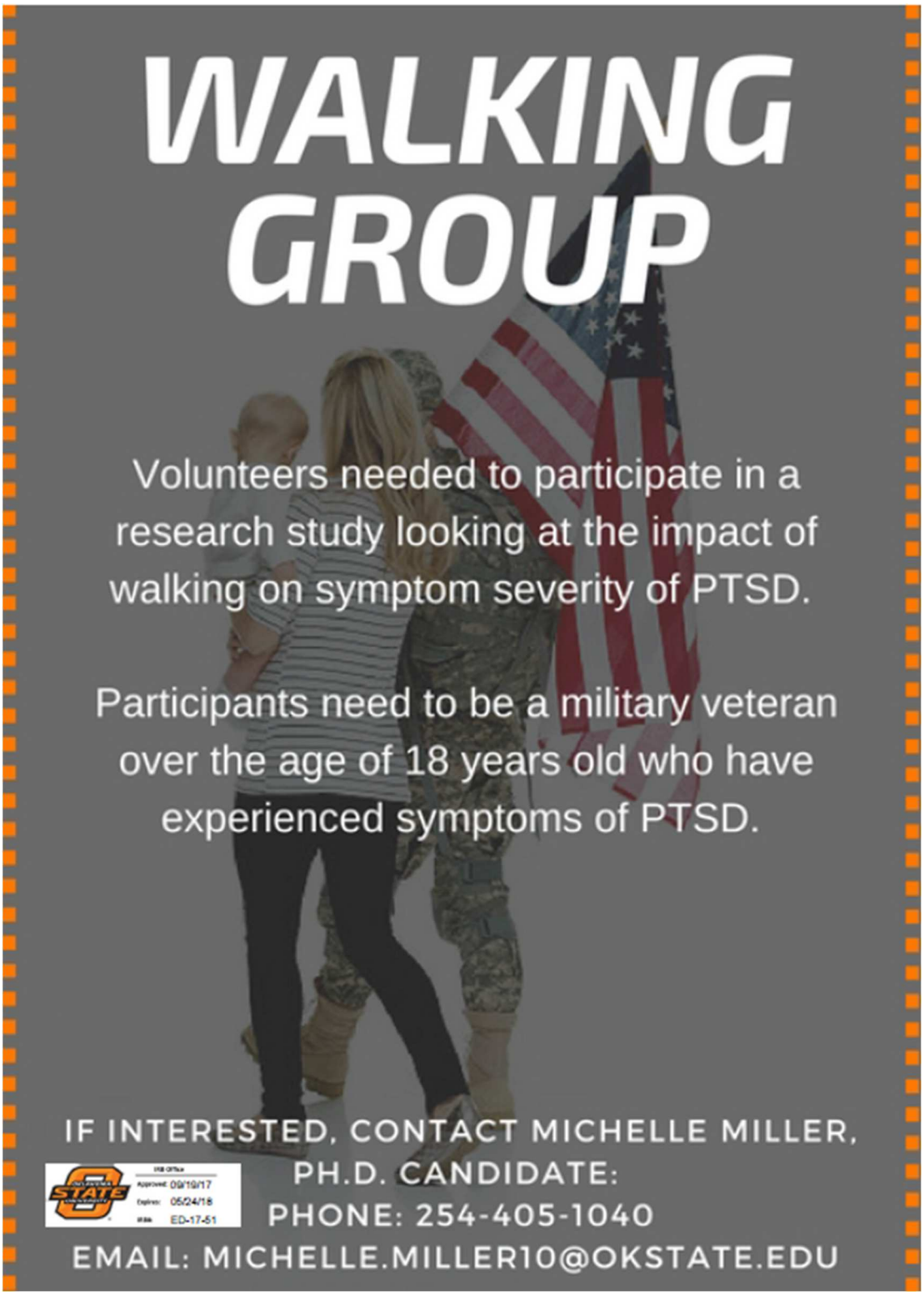
I am conducting a research study for military veterans 18 years of age or older who may be experiencing symptoms of PTSD. The purpose of my study is to determine if implementing a physical activity regimen or a processing group can reduce severity of symptoms of PTSD. The physical activity intervention will consist of participating in a walking group two times per week for 60 minute session each. Participants will be randomly divided into two groups.

Participation in this study will be completely voluntary. You may choose to drop out of this study at any time during the intervention with no penalties. This project has been approved by the Institutional Review Board of Human Research participants at Oklahoma State University.
If you are interested in participating in this research study please let me know after this meeting. I will also provide you with a flier that has my contact information included.

Thank you for your time and I look forward to speaking with you further about this opportunity.

Appendix K

Recruitment Flyer


WALKING GROUP
Volunteers needed to participate in a research study looking at the impact of walking on symptom severity of PTSD.
Participants need to be a military veteran over the age of 18 years old who have experienced symptoms of PTSD.
IF INTERESTED, CONTACT MICHELLE MILLER, PH.D. CANDIDATE:
PHONE: 254-405-1040
EMAIL: MICHELLE.MILLER10@OKSTATE.EDU
Approved: 09/19/17
Expires: 05/24/18
ED-17-51

Appendix L

Physical Activity Log

My Physical Activity Diary **Day** _____

Date (month/day/year)	Time of Day	Description of Activity (Type and Intensity Level)	Duration (in minutes)

Appendix M

Recreational Physical Activity Program Based on the Health Belief Model

Recreational Physical Activity Program (Based on the Health Belief Model)

Health Belief Model processing components of this program have been standardized across both research study groups. The HBM group only engaged in the question and discussion components of this program and did not engage in physical activity.

Recreational Physical Activity Program (Based on the Health Belief Model)

Week 1

Day 1 – Walking Group ***(Perceived Susceptibility and Cues to Action)***

Group size. Approximately 5

Time. 60 minutes

Resources. Walking path

Potential Benefits

- Cognitive: improved concentration, improved judgment (Caddick & Smith, 2014; Penedo & Dahn, 2005).
- Psychosocial: increased sense of belonging, increased social interactions (Caddick & Smith, 2014; Lundberg, Bennett, & Smith, 2011; Penedo & Dahn, 2005).
- Physical: increased cardiovascular health (Penedo & Dahn, 2005; Sareen, Houlahan, Cox, & Asmundson, 2005)
- Affective: improved mood state, decreased anxiety (Caddick & Smith, 2014; Lundberg et al., 2011; Whitworth & Ciccolo, 2016).

Goals

1. Increase physical activity and address each participant's perceived susceptibility, or beliefs, about their chance of experiencing PTSD or symptoms of PTSD due to being physically inactive.

2. Increase physical activity and address each participant's cue to action (e.g., activate the motivating factors of the specific individual).

Objectives

1. By the end of the group, the participant will verbalize 2 current physical activities that put them at risk for experiencing PTSD.
2. By the end of the group session, the participant will verbalize the impact the above stated physical activities have on their readiness to act (e.g., engage in physical activity).
3. By the end of the group, the participant will verbalize 2 potential cues to action.
4. By the end of the group, the participant will verbalize 2 things (e.g., find a low-cost treatment alternative, etc.) that would help them start to engage in physical activity.

Activity Summary

There will be two major components to this activity, a leisure education portion and a recreational physical activity portion.

Leisure education (15 minutes). The participants will get 10 minutes to warm up. During the warm up, the researcher will front load the topic by addressing the first and fifth constructs of the HBM (perceived susceptibility and cues to action). The researcher will learn the beliefs of the participants about their susceptibility to PTSD by asking the suggested questions below. The researcher will also provide education on how their current activities (e.g., physical inactivity) can put them more at risk to experience symptoms of PTSD (e.g., more susceptible) (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The researcher will also learn what influences each participant and distinguish specific motivators by asking the suggested questions below. The researcher will help the participants identify what it would take for them (e.g., support group, credibility partner, etc.) to start engaging in regular physical activity and use that information as a prompt or cue to action to help the individuals move into a state of readiness

to take action (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of questions and facts that can be presented to the group to address their current activities that may make them more susceptible to experiencing PTSD and questions to help determine cues to action:

- The researcher will discuss the potential variables that can impact a person's susceptibility to experiencing symptoms of PTSD. Potential variable include, but not limited to, ethnicity, sex, age, marital status, physical inactivity, avoiding symptoms, number of trauma-related experiences, socioeconomic status, level of education, substance, abuse, and/or a diagnosed medical condition (physical or mental).
- Experiencing symptoms of PTSD makes a person more susceptible to other mental health conditions, such as anxiety and depression. The symptoms of PTSD may lead to increased general anxiety due to fear of when the symptoms of PTSD will arise. The symptoms of PTSD may lead to depression because symptoms of PTSD involve isolation and can be difficult to manage.
    - What mental health conditions do you feel you are more susceptible to because of your symptoms of PTSD?
- Research shows that an inactive or sedentary lifestyle will increase a person's risk of experiencing symptoms of PTSD.
    - Would you rather participate in leisure time activities that involve physical activity or do not involve physical activity? Why?
    - What are some ways you can increase your physical activity?

- Avoidance of social interactions may place a person at a greater risk for experiencing symptoms of PTSD because it could leave more opportunities for ruminating thoughts.
    - What are some ways you can increase your social interactions?
    - What are some techniques you use to interact with other people?
- What do you think makes you susceptible to experiencing symptoms of PTSD?
- Do you know that persons who experience symptoms of PTSD are less likely to engage in planned physical activity than persons who do not experience symptoms of PTSD due to avoidance of feeling bodily arousal such as increased heart rate and shortness of breath?
    - Do you engage in physical activity? If so, how often?
    - What types of physical activity?
    - How do you feel after engaging in physical activity?
    - What benefits do you receive from planned physical activity?
- Did you now persons with PTSD are more likely to experience chronic pain (that stems from the traumatic event) than those without PTSD?
    - Do you experience chronic pain? If so, what type?
    - What have you done to reduce that pain?
    - Has physical activity helped to decrease your pain?
- The researcher will provide the following information, as education to the group, about how both internal and external motivator's impact cues to action. Extrinsic motivators can range from tangible prizes to an encouraging statement or recognition. Intrinsic motivators seek personal satisfaction and are more about

personal accomplishment than tangible prizes. Intrinsic motivators may look like engaging in physical activity because it is fun or simply because it makes a person feel good, or they are good at that activity. Several basic strategies have been shown to cause change and increase motivation; such as marking specific dates on a calendar, setting email reminders, having an accountability partner, and etc.

    - In general, what motivates you?
    - Do you think those motivators are extrinsic or intrinsic?
- What specifically motivates you to engage in physical activity?
    - What extrinsic motivators would help you engage in regular physical activity?
    - What intrinsic motivators would help you engage in regular physical activity?

Physical Activity (30 minutes). The physical activity intervention will consist of participants walking in a group setting for 30 minutes.

Reflection and Group Processing (15 minutes). After walking, the participants will take 10 minutes to cool down and process the first and fifth construct of the HBM, perceived susceptibility and cues to action, and the impact it can have on an individual's readiness to act (e.g., become physically active). If the participants are unable to identify they are susceptible to experiencing symptoms of PTSD they may not be ready to act. The researcher will provide education on the negative impact symptoms of PTSD will have on all domains of life if left untreated (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of questions and facts that can be presented to the group to address their current activities that may make them more susceptible to experiencing PTSD:

- Please identify at least three risk factors that you have that may make you more susceptible to experiencing symptoms of PTSD.
- Please identify at least three ways you can offset (e.g., increase physical activity, increase social interactions, and address the symptoms of PTSD that are being experienced) the identified risk factors.
- Please identify two intrinsic motivators that impact your cues to action to engage in physical activity.
- Please identify two extrinsic motivators that impact your cues to engage in physical activity.
- Please identify two ways you target your intrinsic motivation.
- Please identify two ways you can target your extrinsic motivation.

Week 1

Day 2 – Walking Group ***(Perceived Susceptibility and Self-Efficacy)***

Group size. Approximately 5

Time. 60 minutes

Resources. Walking path

Potential Benefits

- Cognitive: improved concentration, improved judgment (Caddick & Smith, 2014; Penedo & Dahn, 2005).
- Psychosocial: increased sense of belonging, increased social interactions, (Caddick & Smith, 2014; Lundberg et al., 2011; Penedo & Dahn, 2005).
- Physical: increased cardiovascular health (Penedo & Dahn, 2005; Sareen et al., Asmundson, 2005)

- Affective: improved mood state, decreased anxiety (Caddick & Smith, 2014; Lundberg et al., 2011; Whitworth & Ciccolo, 2016).

Goals

1. Increase physical activity and address each participant's perceived susceptibility, or beliefs, about their chance of experiencing PTSD or symptom of PTSD due to being physically inactive.
2. Increase physical activity and address each participant's confidence in their ability to engage in physical activity.

Objectives

1. By the end of the group, the participant will verbalize 2 current leisure activities (e.g., physical inactivity, smoking, etc.) that put them at risk for experiencing PTSD.
2. By the end of the group session, the participant will verbalize 2 ways the above stated leisure activities can negatively impact their readiness to act (e.g., engage in physical activity).
3. By the end of the group, the participant will verbalize 2 successes they had during the recreational physical activity session.
4. By the end of the group, the participant will verbalize 2 realistic goals for themselves for the next recreational physical activity session.

Activity Summary

There will be two major components to this activity, a leisure education portion and a recreational physical activity portion.

Leisure education (15 minutes). The participants will get 10 minutes to warm up. During the warm up, the researcher will front load the group addressing the first and sixth

constructs of the HBM (perceived susceptibility and self-efficacy). The researcher will learn the beliefs of the participants about their susceptibility to PTSD, similar to what was asked from the first session. The researcher will also provide education on how their current activities (e.g., physical inactivity) can put them at more of a risk to experience symptoms of PTSD (e.g., more susceptible) (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The researcher will also learn each person's individual confidence in his or her ability to engage in physical activity by asking the suggested questions below. The researcher will determine if the participants' self-efficacy toward physical activity is different by type of activity by asking the suggested questions below. The following are examples of questions and facts that can be presented to the group to address their current activities that may make them more susceptible to experiencing PTSD and potential strategies to increase self-efficacy in their ability to engage in physical activity:

- The researcher will provide an overview of what was discussed during week one, day one: The following can impact susceptibility to experiencing symptoms of PTSD, ethnicity, sex, age, marital status, physical inactivity, avoiding the symptoms, number of trauma-related exposures, socioeconomic status, level of education, substance abuse, and/or a diagnosed medical condition (physical or mental).
    - Please re-identify factors that specifically make you more susceptible to experience symptoms of PTSD.
    - Which factors are out of our control?
    - Which factors are within our control?
- The researcher will provide education over how a person talks to themselves has the ability to significantly impact self-efficacy. If a person constantly tells themselves "I can't", "I don't have time", "I am too tired", and/or "I will tomorrow", the odds are it will never happen. Positive self-talk is the start to

improve self-efficacy. It is each individual person's responsibility to be their own best advocate.

- What are some positive things you can start saying to yourself every day?
- What are some positive things you can start saying to yourself everyday specific to physical activity?

Physical Activity (30 minutes). The recreational physical activity intervention will consist of participants walking in a group setting for 30 minutes.

Reflection and Group Processing (15 minutes). After the game the participants will take 10 minutes to cool down and process the first and sixth construct of the HBM, perceived susceptibility and self-efficacy, and the impact it can have on an individual's readiness to act (e.g., become physically active). If the participants are unable to identify they are susceptible to experiencing symptoms of PTSD they may not be ready to act. The researcher will provide education on the negative impact symptoms of PTSD will have on all domains of life if left untreated (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of questions and facts that can be presented to the group to address their current activities that may make them more susceptible to experiencing PTSD:

- In what ways are you susceptible to experiencing symptoms of PTSD?
- Please identify at least three risk factors, within your control, that may make you more susceptible to experiencing symptoms of PTSD.
- Please identify at least three risk factors that are not within your control that may make you more susceptible to experiencing symptoms of PTSD.

- Please identify at least three ways you can offset the identified risk factors (e.g., increase physical activity, increase social interactions, and address the symptoms of PTSD being experienced).
- Please identify two ways negative self-talk has impacted your self-efficacy.
- Please identify two ways positive self-talk can improve your self-efficacy.
- Please identify three positive things you can say to yourself that will help you engage in physical activity.

Week 2

Day 1 – Walking Group *(Perceived Severity and Cues to Action)*

Group size. Approximately 5

Time. 5 minutes

Resources. Walking path

Potential Benefits

- Cognitive: improved concentration, improved judgment (Caddick & Smith, 2014; Penedo & Dahn, 2005).
- Psychosocial: increased sense of belonging, increased social interactions, (Caddick & Smith, 2014; Lundberg et al., 2011; Penedo & Dahn, 2005).
- Physical: increased cardiovascular health (Penedo & Dahn, 2005; Sareen et al., 2005)
- Affective: improved mood state, decreased anxiety (Caddick & Smith, 2014; Lundberg et al., 2011; Whitworth & Ciccolo, 2016).

Goals

1. Increase physical activity and address each participant's perceived severity, or beliefs, about the seriousness and/or consequences of a disease/condition as a result of being physically inactive.
2. Increase physical activity and address each participant's cue to action (e.g., activate the motivating factors of the specific individual).

Objectives

1. By the end of the group, the participant will verbalize 2 medical facts about symptoms of PTSD that can be positively impacted by physical activity (e.g., decrease anxiety, etc.)
2. By the end of this group session, the participant will verbalize 2 low cost treatment options (e.g., engage in physical activity).
3. By the end of the group, the participant will verbalize 2 potential cues to action.
4. By the end of the group, the participant will verbalize 2 things that would help them start to engage in physical activity (e.g., find a low-cost treatment alternative, etc.).

Activity Summary

There will be two major components to this activity, a leisure education portion and a physical activity portion.

Leisure education (15 minutes). The participants will get 10 minutes to warm up, where the researcher will front load the group addressing the second and fifth construct of the HBM (perceived severity and cues to action). The researcher will learn the participant's perception of the severity of their symptoms of PTSD. The researcher will then provide facts about the potential severity of PTSD and discuss the benefits of utilizing recreational physical activity as a low-cost treatment options (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of questions and facts that can be presented to the group to address the severity of symptoms of PTSD they are experiencing and discuss the potential benefits physical activity can provide to offset the severity of symptoms:

- What is your perception of the severity of the symptoms of PTSD you may be experiencing?
    - Based on the PTSD Checklist survey you took during baseline assessments, how severe are your symptoms?

    - Did the PTSD Checklist results surprise you based on what you thought about your symptoms?
- Please identify what type of symptoms you are having, such as anxiety, hyperarousal, change in mood states, decreased quality of life, avoidance, intrusive thoughts, or etc.?
    - In what ways do these symptoms impact your life?
    - Do they hinder you from engaging in physical activity?
    - Do they hinder you from seeking medical treatment?
- The researcher will provide education on how military personnel who experience symptoms of PTSD and who consistently engage in physical activity have less severe symptoms of PTSD than those military personnel who do not consistently engage in physical activity. The researcher will also identify how all intensities (low, moderate, vigorous) have been shown to decrease anxiety and improve mood state.
    - How can you use this knowledge to help motivate you to engage in physical activity?

Physical Activity (30 minutes). The physical activity intervention will consist of participants walking in a group setting for 30 minutes.

Reflection and Group Processing (15 minutes). After walking, the participants will take 10 minutes to cool down and process the second and fifth construct of the HBM, perceived severity and cues to action, and the impact it can have on an individual's readiness to act (e.g., become physically active). If the participants are unable to identify the severity of their disease/condition, they may not be ready to act and the researcher will re-emphasize the severity of PTSD and provide education on how traditional treatment and non-pharmacological treatment

(e.g., physical activity) can positively impact symptoms of PTSD (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of questions and facts that can be presented to the group to address their severity of symptoms and current activities that can decrease the severity of those symptoms:

- Please identify the severity of symptoms of PTSD you are experiencing.
- Please identify if physical activity will or will not help decrease symptoms of PTSD.
- Please identify how often you engage in physical activity.
- Please identify two low-cost ways you can engage in physical activity.

Week 2

Day 2 – Walking Group *(Perceived Severity and Self-Efficacy)*

Group size. Approximately 5

Time. 60 minutes

Resources. Walking path

Potential Benefits

- Cognitive: improved concentration, improved judgment (Caddick & Smith, 2014; Penedo & Dahn, 2005).
- Psychosocial: increased sense of belonging, increased social interactions, (Caddick & Smith, 2014; Lundberg et al., 2011; Penedo & Dahn, 2005).
- Physical: increased cardiovascular health (Penedo & Dahn, 2005; Sareen et al., 2005)
- Affective: improved mood state, decreased anxiety (Caddick & Smith, 2014; Lundberg et al., 2011; Whitworth & Ciccolo, 2016).

Goals

1. Increase physical activity and address each participant's perceived severity, or beliefs, about the seriousness and/or consequences of PTSD as a result of being physically inactive.
2. Increase physical activity and address each participant's confidence in their ability to engage in physical activity.

Objectives

1. By the end of the group, the participant will verbalize 2 medical facts about their PTSD symptoms that can be positively impacted by physical activity (e.g., decrease anxiety, etc.)
2. By the end of this group session, the participant will verbalize 2 low cost treatment options (e.g., engage in physical activity).
3. By the end of the group, the participant will verbalize 2 successes they had during the physical activity session.
4. By the end of the group, the participant will verbalize 2 realistic goals for themselves for the next physical activity session.

Activity Summary

There will be two major components to this activity, a leisure education portion and a physical activity portion.

Leisure education (15 minutes). The participants will get 10 minutes to warm up, where the researcher will front load the group addressing the second and sixth constructs of the HBM (perceived severity and self-efficacy). The researcher will learn the participant's perception of the severity of their PTSD symptoms. The researcher will then discuss the benefits of utilizing recreational physical activity as a low-cost treatment option by stating the suggested statements

below (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The researcher will also learn each person's individual confidence in his or her ability to engage in physical activity. The researcher determines if their self-efficacy toward physical activity is different by type of activity by asking the suggested questions below. The following are examples of questions and facts that can be presented to the group to address the severity of symptoms of PTSD they are experiencing and discuss the potential benefits physical activity may assist in offsetting the severity of symptoms and help the participants identify self-efficacy building strategies:

- The researcher will re-visit each participants initial perceived severity of the symptoms of PTSD they may have experienced were.
    - Was the severity of symptoms of PTSD different than your initial perception of your symptoms?
    - If your perception was different, how could that have hindered your desire to seek or not seek help?
- How has the severity of your symptoms of PTSD impacted the amount of time you spend engaging in physical activity?
- Based on your knowledge of the positive impacts of physical activity, how do you think engaging in physical activity could impact your quality of life?
- What do you think the benefits are to engaging in physical activity in the form of a walking group?
- In what ways can you use this knowledge to help build your self-efficacy in your ability to successfully engage in physical activity?

Physical Activity (30 minutes). The physical activity intervention will consist of participants walking in a group setting for 30 minutes.

Reflection and Group Processing (15 minutes). After the game the participants will take 10 minutes to cool down and process the second and sixth construct of the HBM, perceived severity and self-efficacy, and the impact it can have on an individual's readiness to act (e.g., become physically active). If the participants are unable to identify the severity of PTSD, they may not be ready to act and the researcher will re-emphasize the severity of the condition and provide education on how traditional treatment and non-pharmacological treatment (e.g., physical activity) can positively impact symptoms of the condition (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008).). The following are examples of questions and facts that can be presented to the group to address their severity of symptoms and current activities that can decrease the severity of those symptoms:

- Please identify the severity of symptoms of PTSD you are experiencing.
- Please identify if physical activity will or will not help decrease symptoms of PTSD.
- Please identify how often you engage in physical activity.
- Please identify two low-cost ways you can engage in physical activity.
- Please identify two ways you can improve your self-efficacy in your ability to engage in physical activity.

Week 3

Day 1 – Walking Group *(Perceived Benefits and Cues to Action)*

Group size. Approximately 5

Time. 60 minutes

Resources. Walking path

Potential Benefits

- Cognitive: improved concentration, improved judgment (Caddick & Smith, 2014; Penedo & Dahn, 2005).
- Psychosocial: increased sense of belonging, increased social interactions, (Caddick & Smith, 2014; Lundberg et al., 2011; Penedo & Dahn, 2005).
- Physical: increased cardiovascular health (Penedo & Dahn, 2005; Sareen et al., 2005)
- Affective: improved mood state, decreased anxiety (Caddick & Smith, 2014; Lundberg et al., 2011; Whitworth & Ciccolo, 2016).

Goals

1. Increase physical activity and address each participant's perceived benefits, or beliefs, about the effectiveness of exercising to reduce susceptibility and/or severity of a disease/condition.
2. Increase physical activity and address each participant's cue to action (e.g., activate the motivating factors of the specific individual).

Objectives

1. By the end of the group, the participant will verbalize 2 ways physical activity can reduce their susceptibility and/or severity of symptoms of PTSD.

2. By the end of this group session, the participant will verbalize 2 overall benefits of physical activity (e.g., improve quality of life, improve overall mental health, etc.).
3. By the end of the group, the participant will verbalize 2 potential cues to action.
4. By the end of the group, the participant will verbalize 2 things that would help them start to engage in physical activity (e.g., find a low-cost treatment alternative, etc.).

Activity Summary

There will be two major components to this activity, a leisure education portion and a physical activity portion.

Leisure education (15 minutes). The participants will get 10 minutes to warm up, where the researcher will front load the group addressing the third and fifth construct of the HBM (perceived benefits and cues to action). The researcher will learn the participant's perception on the effectiveness of physical activity for reducing susceptibility and/or severity to PTSD by asking the suggested questions below. The researcher will provide facts on how physical activity can treat/prevent PTSD. The researcher will also learn what influences physical activity of each participant and distinguish specific motivators for each by asking the suggested questions below. The researcher will help the participants identify what it would take for them to start engaging in regular physical activity (e.g., support group, credibility partner, etc.) and use that information as a prompt or cue to action to help the individuals move into a state of readiness to take action (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of questions and facts that can be presented to the group to address the benefits of physical activity for decreasing symptoms of PTSD and identify what potential cues to action:

- Discuss with participants their previous session goals. Discuss the extent to which they met those goals. How did meeting those goals contribute to their physical activity that week.

- The researcher will provide education over the prevalence of PTSD and the impact physical activity plays for decreasing symptoms of PTSD. Approximately 70-80% of military veterans with PTSD have co-existing anxiety and/or depression. Physical activity has been shown to be an effective method to reduce symptoms of anxiety and/or depression. Physical activity has also been shown to reduce the perception of stress. Physical activity has been shown to be an effective leisure time coping mechanism that will help improve mental health and has also been shown to significantly decrease associated chronic pain among persons with PTSD. It is common for military veterans with symptoms of PTSD to avoid seeking treatment, which is why engaging in physical activity is important; because, recent research shows that physical activity is a cost-effective and non-pharmacological way to treat symptoms of PTSD.
    - Please identify ways in which physical activity as impacted the symptoms just mentioned.
    - Please identify reasons why you think you will participate in physical activity.
    - Have you sought treatment for symptoms of PTSD before?
        - If no, can you explain what prevented you from seeking treatment?
        - If yes, what motivates you to continue treatment?
        - If yes, and you do not still currently attend treatment, what stopped you from continuing treatment?

Physical Activity (30 minutes). The physical activity intervention will consist of participants walking in a group setting for 30 minutes.

Reflection and Group Processing (50 minutes).

After walking, the participants will take 10 minutes to cool down and process the third and fifth construct of the HBM, perceived benefits and cues to action, and the impact it can have on an individual's readiness to act (e.g., become physically active). The researcher will focus on re-emphasizing the positive effects physical activity can have on PTSD (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of processing questions that will be presented to the group to address the benefits of physical activity to decrease the severity of symptoms of PTSD:

- Please identify three benefits of physical activity.
- Please identify three benefits of physical activity for the treatment of PTSD.
- Please identify three ways you can increase your physical activity (go on walks, play outside with your kids, etc.).
- What other physical activity may provide you with similar feelings?
- Please identify two ways to improve your cues to action (e.g., setting a reminder, checking in with accountability partner, etc.)

Week 3

Day 2 – Walking Group *(Perceived Benefits and Self-Efficacy)*

Group size. Approximately 5

Time. 60 minutes

Resources. Walking path

Potential Benefits

- Cognitive: improved concentration, improved judgment (Caddick & Smith, 2014; Penedo & Dahn, 2005).
- Psychosocial: increased sense of belonging, increased social interactions, (Caddick & Smith, 2014; Lundberg et al., 2011; Penedo & Dahn, 2005).
- Physical: increased cardiovascular health (Penedo & Dahn, 2005; Sareen et al., 2005)
- Affective: improved mood state, decreased anxiety (Caddick & Smith, 2014; Lundberg et al., 2011; Whitworth & Ciccolo, 2016).

Goals

1. Increase physical activity and address each participant's perceived benefits, or beliefs, about the effectiveness of exercising to reduce susceptibility and/or severity of a disease/condition.
2. Increase physical activity and address each participant's confidence in their ability to engage in physical activity.

Objectives

1. By the end of the group, the participant will verbalize 2 ways physical activity can reduce their susceptibility and/or severity of symptoms of PTSD.
2. By the end of this group session, the participant will verbalize 2 overall benefits of physical activity (e.g., improve quality of life, improve overall mental health, etc.).
3. By the end of the group, the participant will verbalize 2 successes they had during the physical activity session.

4. By the end of the group, the participant will verbalize 2 realistic goals for themselves for the next physical activity session.

Activity Summary

There will be two major components to this activity, a leisure education portion and a recreational physical activity portion.

Leisure education (15 minutes). The participants will get 10 minutes to warm up, where the researcher will front load the group addressing the third and sixth constructs of the HBM (perceived benefits and self-efficacy). The researcher will learn the participant's perception on the effectiveness of physical activity for reducing susceptibility and/or severity to PTSD by asking the suggested questions below. The researcher will provide facts on how physical activity can treat/prevent PTSD by stating the suggested statements below. The researcher will also learn each person's confidence in his or her ability to engage in physical activity. The researcher will determine how each participant's self-efficacy toward physical activity is different by type of activity by asking the suggested questions below. The following are examples of questions and facts that can be presented to the group to address the benefits of physical activity for decreasing symptoms of PTSD and improve self-efficacy:

- The researcher may provide an overview of the benefits of physical activity that was discussed in the previous session. Physical activity can reduce symptoms of anxiety and/or depression. Physical activity has also been shown to reduce the perception of stress and serve as a coping mechanism for physical and mental health problems. Physical activity is a cost-effective and non-pharmacological way to treat symptoms of PTSD.
    - Please identify how physical activity has impacted your life.

- Please identify ways in which you have increased physical activity since participation in this research study.
- In what ways has physical activity helped you manage your symptoms of PTSD?

Physical Activity (30 minutes). The recreational physical activity intervention will consist of participants walking in a group setting for 30 minutes.

Reflection and Group Processing (15 minutes).

After walking, the participants will take 10 minutes to cool down and process the third and sixth constructs of the HBM, perceived benefits and self-efficacy, and the impact it can have on an individual's readiness to act (e.g., become physically active). The researcher will focus on re-emphasizing the positive effects physical activity can have on PTSD (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of processing questions that will be presented to the group to address the benefits of physical activity to decrease the severity of symptoms of PTSD:

- Please identify three benefits of physical activity.
- Please identify three ways you can increase your physical activity (go on walks, play outside with your kids, etc.).
- Please identify three strategies you have used to engage in physical activity more frequently? (e.g., involved your family, participate in recreational physical activity, etc.)
- Do you feel like participating a walking group can improve your self-efficacy to engage in physical activity?
    - If yes, in what ways?

- If no, what would be helpful to increase your confidence in your ability for physical activity?

Week 4

Day 1 – Walking path *(Perceived Barriers and Cues to Action)*

Group size. Approximately 5

Time. 60 minutes

Resources. Walking path

Potential Benefits

- Cognitive: improved concentration, improved judgment (Caddick & Smith, 2014; Penedo & Dahn, 2005).
- Psychosocial: increased sense of belonging, increased social interactions, (Caddick & Smith, 2014; Lundberg et al., 2011; Penedo & Dahn, 2005).
- Physical: increased cardiovascular health (Penedo & Dahn, 2005; Sareen et al., 2005)
- Affective: improved mood state, decreased anxiety (Caddick & Smith, 2014; Lundberg et al., 2011; Whitworth & Ciccolo, 2016).

Goals

1. Increase physical activity and address each participant's perceived barriers, or beliefs, of the costs associated with seeking non-pharmacological interventions for PTSD symptoms.
2. Increase physical activity and address each participant's cue to action (e.g., activate the motivating factors of the specific individual).

Objectives

1. By the end of the group, the participant will verbalize 2 ways physical activity can serve as an effective and low-cost treatment for PTSD.
2. By the end of this group session, the participant will verbalize 2 barriers to treatment physical activity can eliminate for them.
3. By the end of the group, the participant will verbalize 2 potential cues to action.
4. By the end of the group, the participant will verbalize 2 things that would help them start to engage in physical activity.

Activity Summary

There will be two major components to this activity, a leisure education portion and a recreational physical activity portion.

Leisure education (15 minutes). The participants will get 10 minutes to warm up, where the researcher will front load the group addressing the fourth and fifth constructs of the HBM (perceived barriers and cues to action). The researcher will learn the participant's perception on their perceived barriers to treatment (e.g., transportation, negative stigma, etc.). The researcher will then provide facts on how physical activity can serve as an effective non-pharmacological intervention to the disease/condition by stating suggested statements below (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The researcher will also learn what influences each participant and distinguish specific motivators for each by asking the suggested questions below. The researcher will help the participants identify what it would take for them to start engaging in regular physical activity by asking the suggested questions below (e.g., support group, credibility partner, etc.), and use that information as a prompt or cue to action to help the individuals move into a state of readiness to take action (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of questions and facts that can be presented to the group to address potential barriers to seeking treatment for the symptoms of PTSD and cues to action to counter those potential barriers:

- The researcher will address potential barriers to treatment seeking behaviors among military veterans who have experienced PTSD such as high cost, no access, and negative stigma. The researcher will also address how physical activity can offset those barriers by providing a low-cost and easily accessible alternative to traditional treatments because research shows that when a person engages in regular physical activity it can improve severity of PTSD symptoms. Physical activity may serve as a way to reduce barriers associated to health seeking behavior because it is a low-cost alternative and has been shown to have a positive impact on physical and mental health.
- What are some barriers to treatment you have experienced?
    - In what ways have you found to be successful in overcoming those barriers you have experienced?
    - Do you still use these strategies to overcome barriers?

Physical Activity (30 minutes). The physical activity intervention will consist of participants walking in a group setting for 30 minutes.

Reflection and Group Processing (15 minutes). After walking, the participants will take 10 minutes to cool down and process the fourth and fifth construct of the HBM, perceived barriers and cues to action, and the impact it can have on an individual's readiness to act (e.g., become physically active). If the participants are unable to identify the potential barriers and ways to overcome those barriers, they may not be ready to act and the researcher will reinforce the impact physical activity can have on their condition and how it can serve as an non-pharmacological intervention, which has the potential to reduce barriers to treatment (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of processing

questions that will be presented to the group to address the potential barriers to treatment for military veterans who experience symptoms of PTSD:

- Cost, transportation, and negative stigma are examples of common barriers to treatment seeking behavior for military veterans.
- What might be some others, whether you experienced them or not?
- Please identify 3 barriers that you have encountered.
- Please identify 3 ways physical activity can counter the barriers to health seeking behavior.
- Do you think participating in a walking group can eliminate barriers to treatment for PTSD?
    - In what ways do you think it helps to overcome barriers?
- Identify ways you can use this knowledge as a cue to action to engage in physical activity.

Week 4

Day 2 – Walking Group *(Perceived Barriers and Self-Efficacy)*

Group size. Approximately 5

Time. 60 minutes

Resources. Walking path

Potential Benefits

- Cognitive: improved concentration, improved judgment (Caddick & Smith, 2014; Penedo & Dahn, 2005).
- Psychosocial: increased sense of belonging, increased social interactions, (Caddick & Smith, 2014; Lundberg et al., 2011; Penedo & Dahn, 2005).

- Physical: increased cardiovascular health (Penedo & Dahn, 2005; Sareen et al., 2005)
- Affective: improved mood state, decreased anxiety (Caddick & Smith, 2014; Lundberg et al., 2011; Whitworth & Ciccolo, 2016).

Goals

1. Increase physical activity and address each participant's perceived barriers, or beliefs, of the costs associated with seeking non-pharmacological interventions (e.g., physical activity) for PTSD.
2. Increase physical activity and address each participant's confidence in their ability to engage in physical activity.

Objectives

1. By the end of the group, the participant will verbalize 2 ways physical activity can serve as an effective and low-cost treatment for PTSD.
2. By the end of this group session, the participant will verbalize 2 barriers to treatment physical activity can eliminate for them.
3. By the end of the group, the participant will verbalize 2 successes they had during the physical activity session.
4. By the end of the group, the participant will verbalize 2 realistic goals for themselves for the next physical activity session.

Activity Summary

There will be two major components to this activity, a leisure education portion and a recreational physical activity portion.

Leisure education (15 minutes). The participants will get 10 minutes to warm up, where the researcher will front load the group addressing the fourth and sixth construct of the HBM

(perceived barriers and self-efficacy). The researcher will learn the participant's perception on their perceived barriers to treatment (e.g., transportation, negative stigma, etc.). The researcher will then provide facts on how physical activity can serve as an effective non-pharmacological intervention to PTSD by stating below suggested statements (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The researcher will also learn each person's individual confidence in his or her ability to engage in physical activity by asking the suggested questions below. The researcher will determine each participants self-efficacy toward physical activity is different by type of activity by asking the below suggested questions. The following are examples of questions and facts that can be presented to the group to address potential barriers to seeking treatment for the symptoms of PTSD and strategies to improve self-efficacy:

- The researcher will reiterate the significance of barriers to treatment seeking behavior and how if the symptoms of PTSD are not addressed they will get more severe. The researcher will address the benefits of physical activity for improving symptoms of PTSD and how physical activity can also offset potential barriers, such as providing a cost-effective and easily accessible alternative.
- What are some of your major barriers to seeking treatment for symptoms of PTSD?
- In what ways can physical activity help eliminate those barriers?

Physical Activity (30 minutes). The physical activity intervention will consist of participants walking in a group setting for 30 minutes.

Reflection and Group Processing (15 minutes). After walking, the participants will take 10 minutes to cool down and process the fourth and sixth construct of the HBM, perceived barriers and self-efficacy, and the impact it can have on an individual's readiness to act (e.g.,

become physically active). If the participants are unable to identify the potential barriers and ways to overcome those barriers, they may not be ready to act and the researcher will reinforce the impact physical activity can have on their condition and how it can serve as a non-pharmacological intervention, which has the potential to reduce barriers to treatment (Castonguay et al., 2016; Jones et al., 2014; Speer et al., 2008). The following are examples of processing questions that will be presented to the group to address the potential barriers to treatment for military veterans who experience symptoms of PSD:

- Please identify three barriers that have stopped or limited you from seeking treatment for your symptoms of PTSD.
- Please identify three ways physical activity can counter the barriers to health seeking behavior.
- What were some of the more impactful strategies you used to improve your self-efficacy to engage in physical activity?

VITA

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Candidate for the Degree of

Doctor of Philosophy

Dissertation: IMPACT OF MODERATE INTENSITY PHYSICAL ACTIVITY ON SY MPTOM SEVERITY OF PTSD AMONG MILITARY VETERANS

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2013-present: American College of Sports Medicine (ACSM) – Student member
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